SL70 PLUS Series Pathfinder Radar Display

Owner's Handbook

Document number: 81205_2
Date: September 2002

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September 2002

INTENDED USE

The display units detailed in this handbook may form part of navigational radar systems intended for light marine use. These displays and radar systems are only an aid to navigation.

SAFETY NOTICES

This radar equipment must be installed and operated in accordance with the instructions contained in this manual. Failure to do so can result in personal injury and/or navigational inaccuracies. In particular:

1. HIGH VOLTAGE. The LCD display unit and scanner unit contain high voltages. Adjustments require specialized service procedures and tools only available to qualified service technicians – there are no user serviceable parts or adjustments. The operator should never remove the display unit cover or attempt to service the equipment.

2. ELECTROMAGNETIC ENERGY. The radar scanner transmits electromagnetic energy. It is important that the radar is turned off whenever personnel are required to come close to the scanner to perform work on the scanner assembly or associated equipment.

It is recommended that the radar scanner is mounted out of range of personnel (above head height).

Avoid looking directly at the antenna as your eyes are the most sensitive part of the body to electromagnetic energy.

When properly installed and operated, the use of this radar will conform to the requirements of ANSI/IEEE C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3Hz to 300 GHz and NRPB, Board Statement on Restrictions on Human Exposure to Static and Time Varying Electromagnetic Fields and Radiation. *Doc NRPB, N0. 5 (1993).*

3. NAVIGATION AID. This unit is only an aid to navigation. Its accuracy can be affected by many factors, including equipment failure or defects, environmental conditions, and improper handling or use. It is the user's responsibility to exercise common prudence and navigational judgements. This unit should not be relied upon as a substitute for such prudence and judgement.

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UNITED STATES Raymarine Inc.
22 Cotton Road, Unit D
Nashua, NH 03063-4219
Telephone: +1 603 881 5200
+1 800 539 5539
Fax: +1 603 864 4756

EUROPE Raymarine Limited
Anchorage Park
Portsmouth
Hampshire PO3 5TD
England
Telephone: +44 (0) 23 9269 3611
Fax: +44 (0) 23 9269 4642

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Preface

This handbook describes the following PLUS series displays from Raymarine:

System		Display	Scanner	Chartplotter
Pathfinder Radar -	Mono display	SL70M	Yes	No
	Color display	SL70C	Yes	No

Note: *Radar systems are supplied with an appropriate Raymarine scanner unit and inter-connecting cable. Details for installing the scanner are described in the Pathfinder Radar Scanner Owner's Handbook.*

This handbook contains very important information on the installation and operation of your new equipment. In order to obtain the best results in operation and performance, please read this handbook thoroughly.

Raymarine's Technical Services representatives or your local dealer will be available to answer any questions you may have.

TFT Color LCD Displays

The colors of the display may seem to vary when viewed against a colored background or in colored light. This is a perfectly normal effect that will be seen with all color LCD displays.

In common with all Thin Film Transistor (TFT) LCD displays, the screen may exhibit a few (less than 20) wrongly illuminated pixels. These may appear as black pixels in a light portion of the screen, or as colored pixels in black areas.

CAUTION:
To provide protection against the damaging effects of UV light, it is advisable to replace the sun cover provided when the color LCD display is not in use.

Warranty

To register your display unit ownership, please take a few minutes to fill out the warranty registration card found at the end of this handbook. It is very important that you complete the owner information and return the card to the factory in order to receive full warranty benefits.

EMC Conformance

All Raymarine equipment and accessories are designed to the best industry standards for use in the recreational marine environment.

The design and manufacture of Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised.

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Chapter 1: Overview

How to Use This Handbook

This handbook describes the following displays:

SL70MPLUS Pathfinder Radar, 7" Mono Display
SL70C PLUS Pathfinder Radar, 7" Color LCD Display

If you are installing the display system yourself, you should read *Chapter 6* before you start the installation. This chapter also provides information that will be useful if you are connecting your system to other equipment.

For an overview of the display unit controls and the radar system, read *Chapter 1*. *Chapter 2* will help you start using your system.

For detailed information on radar operations refer to *Chapter 3:Standard Radar Operations* and *Chapter 4:Integrated Radar Operations*.

To change the system set up defaults, read *Chapter 5*.

Details for installing a radar scanner are provided in the *Pathfinder Radar Scanner Owner's Handbook* supplied with your scanner.

Note: *Many illustrations in this handbook show example screens. The screen you see on your display depends on your system configuration and set up options, so it may differ from the illustration.*

This handbook is organized as follows:

Chapter 1 provides an overview of the features and functions of the Display. This chapter also provides an overview of the controls. You should read this chapter to familiarize yourself with the system.

Chapter 2 explains how to start using the display and describes how to use some of the basic radar functions.

Chapter 3 provides detailed operating information for the main radar functions - adjusting the radar picture; measuring distances and bearings; setting guard zones and alarms; using MARPA for target tracking.

Chapter 4 provides detailed operating information for integrated radar system functions, including using marks, man overboard and cursor echo.

Chapter 5 provides instructions for setting up your system to suit your preferences. You should read this chapter to determine how to set up the radar system defaults.

Chapter 6 provides planning considerations and detailed instructions for installing the display unit. It should be referred to when you are ready to install the system. Details to connect the display to other equipment are also

provided. To install a complete radar system, you will also need to read the Owner's Handbook supplied with the scanner.

Chapter 7 provides information on user maintenance, and what to do if you experience problems.

The Appendices provide additional information that you may find useful:
Appendix A lists the technical specifications for the radar.
Appendix B defines the SeaTalk and NMEA data that is transferred on integrated systems.
Appendix C provides details on connecting a Raymarine heading sensor for MARPA.
Appendix D provides a list of abbreviations.
An Index and warranty information are included at the end of the handbook.

A summary of the radar controls are provided on the Quick Reference Card supplied with your system.

Terminology

The following terminology is used to describe radar systems:

Master	A unit capable of sourcing specific data such as radar data.
Radar Display	Unit providing Radar Master functionality.
Integrated System	Additional instruments are connected via the Seatalk or NMEA interfaces.

1.1 General

The Pathfinder PLUS Radar comprises the SL70M (Mono) or SL70C (Color) display unit, scanner unit and associated cables.

Display Unit

The display unit is waterproof to CFR46 and can be installed either above or below deck.

The unit includes:

- 7" color or mono LCD PLUS display
- Trackpad
- Eleven dedicated (labeled) control keys
- Four soft keys (unlabeled) whose functionality changes

The display and keys can be illuminated for night-time use.

Scanner

The Pathfinder Radar is supplied with a scanner unit which illuminates targets with microwave energy and then collects the returns from those targets. The scanner includes a sensitive low-noise front end receiver, and a variety of clutter attenuation controls to maintain target resolution.

The scanner is adjusted and operated from the display unit, so these details are provided in this Handbook. It can be switched between transmit and stand-by modes. It also has a power-saving timed transmit mode which pauses between bursts of transmissions. Installation of the scanner is described separately in the Scanner Owner's Handbook.

PLUS Display Units

Features

- Uses position data from GPS, DGPS, WAAS or Loran-C technology
- Displays and transfers SeaTalk and NMEA data
- Half-screen windows to display additional data: Course Deviation Indicator (CDI), Bearing and Distance Indicator (BDI), navigation data.
- Cursor echo across SeaTalk
- Choice of orientation: Head Up, Course Up and North Up
- The system can be connected to an ST80 Navigator keypad for entry of alpha-numeric data.

Set Up Options

Set up options allow you to choose what is displayed, how it is displayed (including language and units), bearing mode and how the display operates with other equipment. You can view the cursor position and a variety of data from other equipment, e.g. speed, heading, depth, wind and tide information in a set of user-selectable data boxes. For systems with an autopilot, when the status and locked heading information change the new data can be displayed.

Display options are provided in System Set Up, described in *Chapter 5*. Screen Presentation Options, described in *Chapter 2* allow you to switch the cursor and data boxes On/Off. The cursor box and user-selected data boxes can be moved around the screen.

Operating Modes

You can view a full screen radar.You can also set *Windows On* to split the display into two half-screen windows to show supplementary data. The main operating mode (radar) is displayed in the upper window; you choose what is displayed in the lower window.
The following are available:

Table 1-1: Operating Modes and Window Options

Display	Full-screen mode	Half-screen Window Options
SL70C, SL70M PLUS	Radar	CDI, BDI or Nav Data

Half-Screen Window Options

- **Radar display:** Data can be displayed full screen or in a half-screen window.
- **CDI:** This gives the Course Deviation Indicator graphical display, with data relating to the target waypoint.
- **BDI:** This gives the Bearing and Distance Indicator graphical display, with data relating to the target waypoint.
- **Nav Data:** This shows nine (mono display) or sixteen (color display) data boxes, providing navigational data in the units specified in your set up. Note that up to 6 of these data boxes are also available as a *user-selectable group* (see *Section 5.3*).

You select the operating mode and windows using the **DISPLAY** key as described in *Chapter 2*.

Heading and Position Data

Full functionality of the radar is achieved when it is part of an integrated system with other equipment connected via SeaTalk or NMEA 0183. Data from this equipment including position and heading is shown on the display and is used in calculations.

Details on connecting other equipment are given in *Chapter 6*.

Providing Heading Data for MARPA

The performance of MARPA is dependent on the quality of your heading sensor. It is important that both the heading sensor and the radar scanner (bearing alignment) are correctly calibrated. Refer to the appropriate heading sensor and radar scanner handbooks for calibration details. The better the accuracy of your heading data, the better the performance of MARPA.

A gyro compass provides the best performance in all conditions. Alternatively you could use a fluxgate compass with rate gyro stabilization.
MARPA requires heading data to be frequently updated (we recommend a data output rate of greater than 8 Hz); heading data must therefore be provided to the display on NMEA.

We recommend the Pathfinder Smart Heading System (which includes the Gyro Plus 2 unit). Good results are also obtained with a Raymarine autopilot system incorporating a 150G or 400G Course Computer with internal rate gyro.

Other heading sensors connected on NMEA *may* provide satisfactory results in reasonable sea states. However, in unsettled conditions a rate gyro compass is advisable.

Contact Raymarine Customer Services or your authorized Raymarine dealer for additional information. For specific configuration details with the Raymarine course computer refer to *Appendix C*. If you are using a suitable third party heading sensor, refer to its documentation for installation and calibration details.

1.2 The Pathfinder Radar PLUS Display

When a scanner is connected and the radar is in Transmit mode, the radar picture provides a map-like representation of the area in which the radar is operating. Typically, your ship's position is at the centre of the display, and its dead ahead bearing is indicated by a vertical heading line, known as the Ship's Heading Marker (SHM).

The radar picture can be viewed with a variety of fixed or customised range scales. On color displays, the color of the radar returns (echoes) indicates their intensity: the strongest returns are shown in yellow and the weaker are shown in shades of blue. A status bar at the top of the radar image displays range, current heading and mode indicators for the various options you can set. An example radar picture is shown on the next page, with example radar returns (echoes) and default Pathfinder Radar information. The Status Bar is also illustrated.

The radar display can show additional information, depending on your currently selected options, set up selections and the data available from other equipment. The example displays on the following pages show some of these features.

Functions are available to control the display as follows:

- Zoom the Display
- Offset your vessel from the centre of the radar picture

Operation of these functions is described in *Chapter 2*.

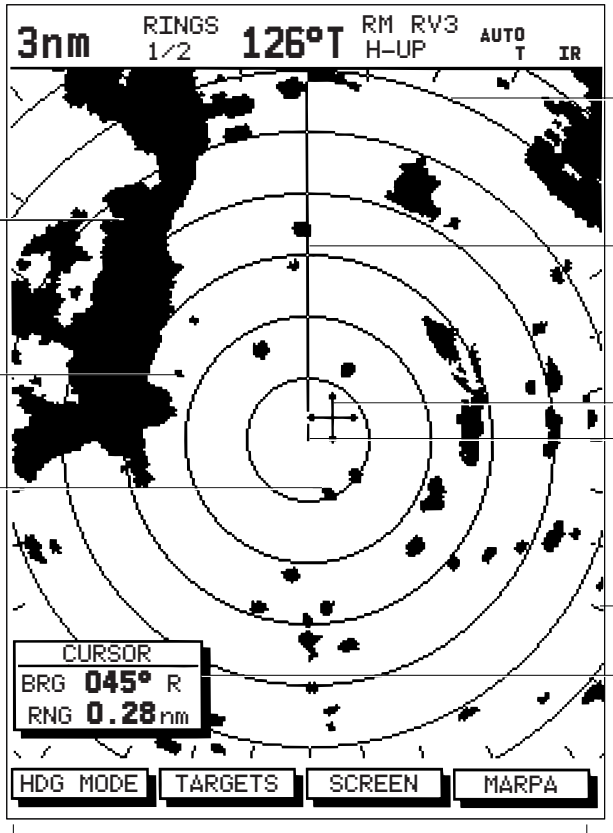
Pathfinder Radar PLUS Display Options

In addition to the display set up options previously described, radar set up options allow you to customise the radar image by selecting how radar marks and Electronic Bearing Line (EBL) data are displayed. You can also specify timed transmit mode and custom range scales.

The Screen Presentation Options, described in *Chapter 2* allow you to switch range rings on/off and waypoint display on/off.

Note: *When you turn the display off and on again, the Screen Presentation settings are retained in memory.*

Default Display



Targets:

Landmass

Channel buoy

Surface vessel

Status Bar

Range rings
The number and spacing depend on the current range, or you can turn them off

Ship's Heading Marker (SHM)
You can hide this temporarily

Cursor position, controlled by the trackpad

Ship's position
You can move this off-centre if required

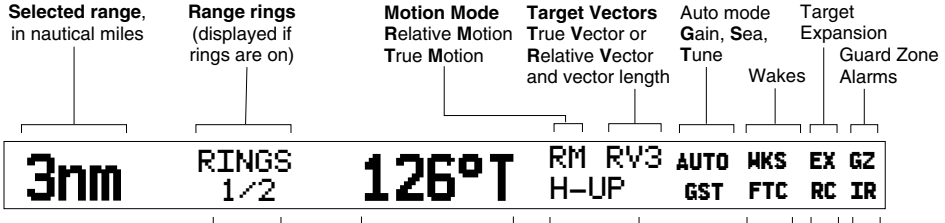
Bearing scale, each tick indicating 2° of azimuth

Cursor position box
Shows the current cursor position as either Range/Bearing or Lat/Long. You can move this box to your preferred position on the screen, or turn it off.

Default soft key labels
These can be turned off; press any soft key to re-display them. Different labels are displayed when you press a key.

D3600-6

Status Bar



Mode Indicators
displayed when function on:

Selected range, in nautical miles

Range rings (displayed if rings are on)

Motion Mode
Relative **M**otion
True **M**otion

Target Vectors
True **V**ector or
Relative **V**ector
and vector length

Auto mode
Gain, **S**ea, **T**une

Wakes

Target Expansion

Guard Zone Alarms

Range ring interval
Not displayed if range rings are off

Current heading
if data available, or Course Over Ground. Displayed in degrees Magnetic or True

Heading mode
Normally Head Up (H-UP); Course Up (C-UP) or North Up (N-UP) can be selected if heading data available

Rain Clutter

FTC
(Remote rain)

Interference Rejection

D3993-2

Figure 1-1: Radar Display Features

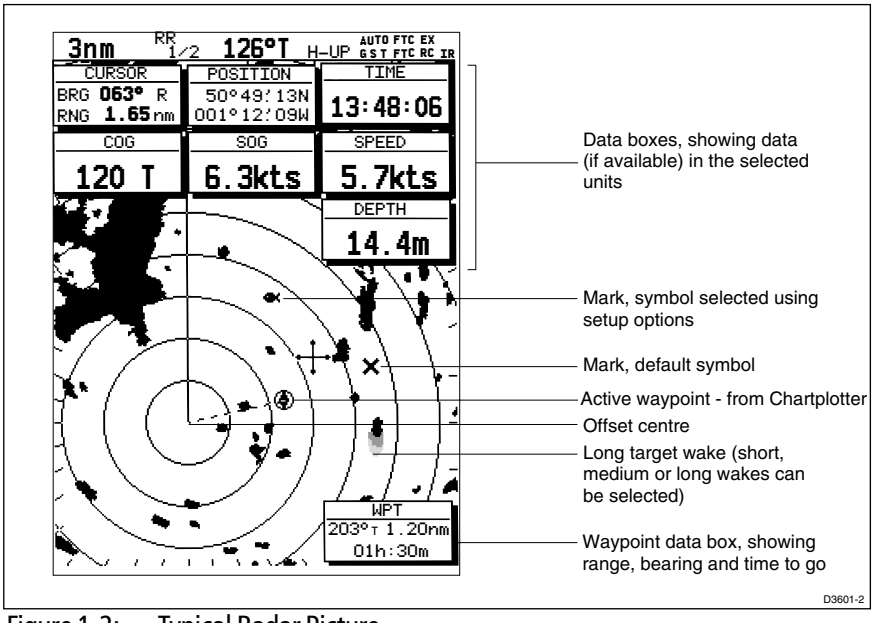


Figure 1-2: Typical Radar Picture

Radar Functions

The Pathfinder Radar includes the following functions:

- Choice of range scales from 1/8 nm to 72nm (dependent on scanner type).
- Automatic and manual control of tuning, gain and sea clutter.
- Two Variable Range Markers (VRMs) and Electronic Bearing Lines (EBLs), allowing target range and bearing measurements. VRM/EBLs can be floated.
- Target wakes and target expansion mode.
- Two guard zones with alarms.
- Add marks to record important or dangerous locations.
- Man Overboard (MOB) to navigate back to a person or object.
- 10 Target MARPA

Operation of these radar functions is described in *Chapter 3* and *Chapter 4*.

1.3 Operating Controls

You operate the radar using a variety of controls:

- A trackpad providing up, down, left, right and diagonal control of an on-screen cursor.
- Eleven dedicated (labeled) control keys.
- Four soft keys with labels displayed on the screen.
- Pop-up menus, displayed on-screen, from which you select options.
- Database lists, displayed on-screen, which enable you to edit items.

Note: *The cursor is the cross-hair symbol (+) visible on the display. You move the cursor using the trackpad and use it to select a position or item on the chart.*

The control keys are shown in *Figure 1-3*. They are back-lit for night-time use. When you use a control, a help message is displayed at the top of the screen (unless you switch help off as described in *Chapter 5*). The following paragraphs describe the controls and on-screen facilities.

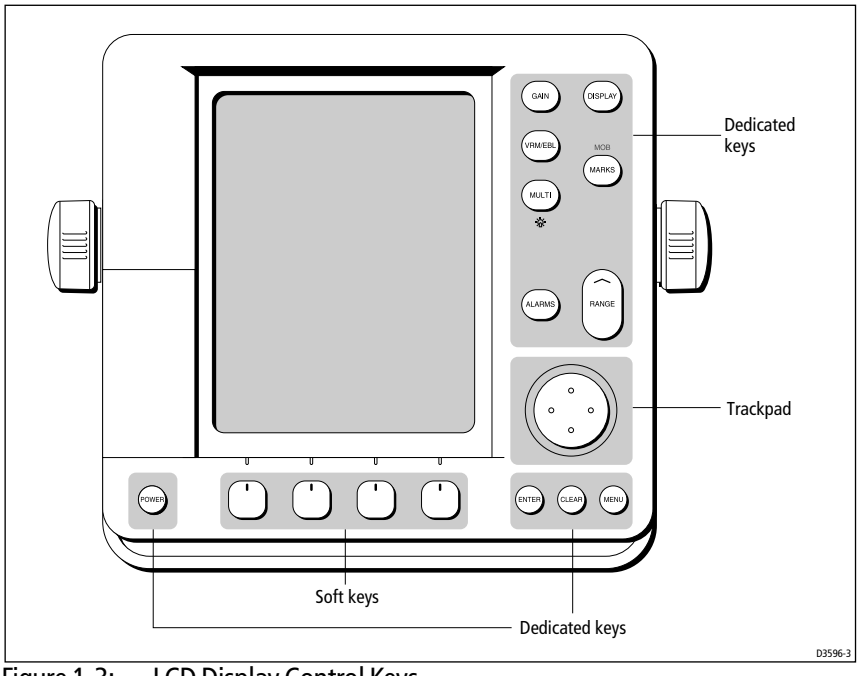


Figure 1-3: LCD Display Control Keys

Trackpad and Cursor

The trackpad has several functions:

- To move the cursor around the screen
- To select an item from a pop-up menu
- To adjust a variable soft key control

The cursor is used to:

- Select a position on the screen.
- Select an item, e.g. guard zone.
- Select an area of the radar image to zoom into .

Moving the Cursor

You can press on any of the four sections of the trackpad to move the cursor in that direction (up, down, left or right), or press two sections at the same time to move diagonally. The cursor moves faster as you continue to press the trackpad. The current cursor position is shown in the cursor data box (if selected).

Note: *During many operations you cannot move the cursor around the screen; if you cannot move the cursor using the* trackpad*, check the default soft keys are displayed (unless they have been switched OFF in system set up). If not, press* **ENTER** *until they are displayed.*

The cursor is normally displayed as a crosshair. However, if you have not moved the cursor for more than five seconds, when you next move it the cursor is outlined by a circle so it is easier to locate on the screen.

Context-Sensitive Cursor Control

The cursor is context-sensitive. When the cursor is positioned over special features on the display a text label appears to identify the feature as detailed in *Table 1-2* .

Moving and deleting items with the context-sensitive cursor

Some items on the radar screen have information associated with them. Most information is displayed in a data box. The context-sensitive cursor allows you to move databoxes. It also allows you to move or delete other items, such as radar guard zones. Further details of items that can be moved or deleted are given in the appropriate sections throughout this handbook.

➤ To move any data box or selectable item:

1. Use the trackpad to position the cursor over the item until the item's label is displayed.
2. Press **ENTER** to take control of the item, use the trackpad to move it to the required position.
3. Press **ENTER** again to fix the position, or press **CLEAR** to abandon the move.

➤ To delete an item:

1. Use the trackpad to position the cursor over the item until the item's label is displayed then press **CLEAR**.

Table 1-2: Context-Sensitive Cursor Text Labels

Text Label	Feature
BOX	Data box (any type)
MOB	Man Over Board marker
MRK	Radar Mark
WPT	Chart Waypoint
CTR	Center of radar
FLT	Floating EBL/VRM
GRD	Guard zone
MARPA	MARPA Target
SHM	Ships Heading Marker
VRM/EBL	VRM and EBL, 1 or 2
ZMB	Zoom box

Dedicated Keys

The dedicated keys: **DISPLAY, MARKS, GAIN, VRM/EBL, MULTI, ALARMS, RANGE, ENTER, CLEAR, MENU** and **POWER** have fixed functions; the functions are similar on all Pathfinder displays. For example, **ALARMS** is used to set up the system alarms on both a chartplotter and a radar.

Some keys can be used in two ways:

- **Press:** Press the key momentarily and then release it. This method is used for most key operations.
- **Press and hold:** Press the key and hold it down for the length of time stated (for example, 3 seconds), and then release it.

When you press a dedicated key, one of the following happens:

i. The associated operation is actioned, e.g. change chart scale (**RANGE**).

ii. A pop-up menu is displayed, providing further options.

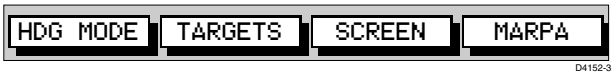
iii. A set of soft keys is displayed, providing further functions.

As you press a key, a single audio beep confirms the key action. If the key-press is not valid for the current screen or mode, three rapid beeps sound to indicate that no response is available. If required, you can turn the key beeps off as part of your set up procedure (see *Chapter 5*).

Soft Keys

The four keys below the screen are called soft keys because their functions change according to the operation. The soft keys are grouped into related sets and subsets providing access to the various functions. The soft key labels are

displayed on the screen just above the keys. The default soft keys are displayed until you press a key, or select an item on the screen; the soft keys associated with the action are then displayed.



The currently selected soft key option is shown by its gray or green background. If the key text is displayed in gray rather than in black, it is not currently available.

When you press a soft key one of the following happens:

i. The associated operation is actioned, e.g. NORTH UP.

ii. A sub-set of soft keys is displayed, providing further functions.

iii. A pop-up menu is displayed, providing further options.

As with dedicated keys, when you press a soft key a single audio beep confirms the key action. If the key-press is not valid for the current screen or mode, three rapid beeps sound to indicate that no response is available. If required, you can turn the key beeps off as part of your set up procedure (see *Chapter 5*).

Pop-Up Menus

Pop-up menus usually provide set up options. When a pop-up menu is on-screen, a set of associated soft keys is also displayed as shown in *Figure 1-4*.

You use the trackpad to select an option from the menu, then use the appropriate soft key to set the option. For example, you can toggle the OFF TRACK ALARM on/off.

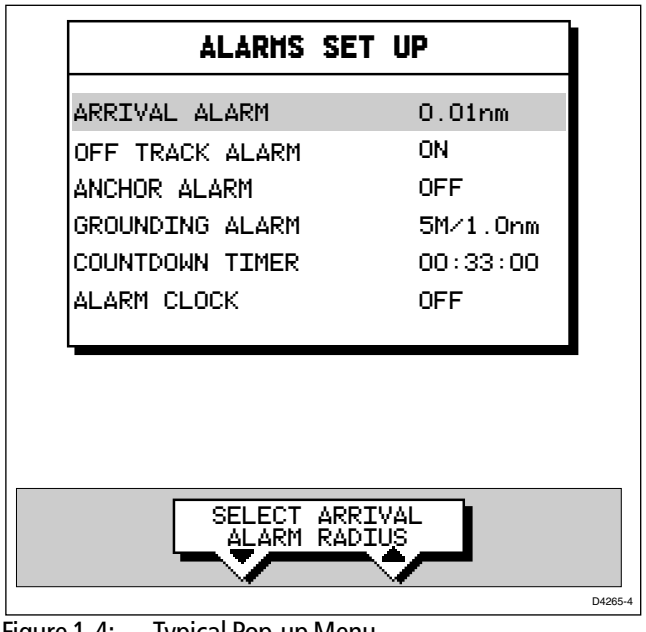


Figure 1-4: Typical Pop-up Menu

Database Lists

The waypoints, routes and tracks that you create on the chartplotter are stored in database lists. You can view these lists and select items for editing.

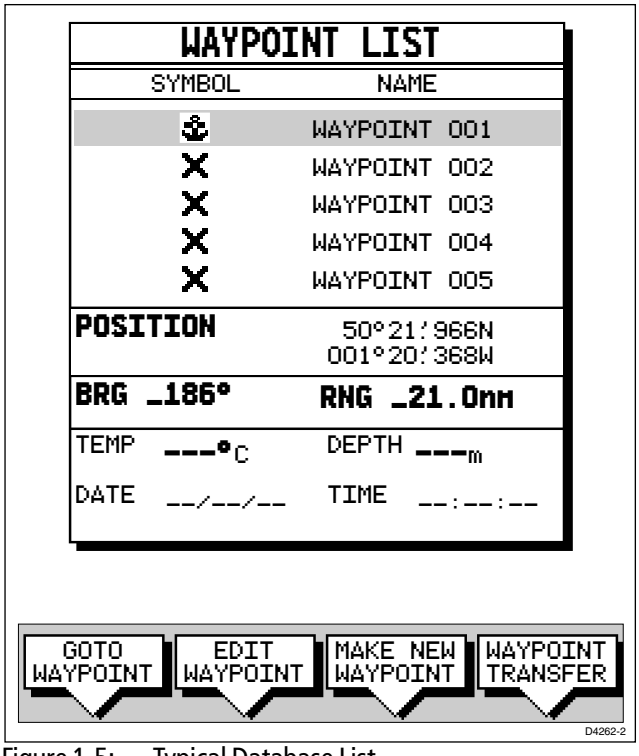


Figure 1-5: Typical Database List

As with pop-up menus, when a database list is on-screen, a set of associated soft keys is also displayed; you use the trackpad to select an item from the list, then use the appropriate soft key to edit the item. For example, you can erase a waypoint or a route.

Chapter 2: Getting Started & Adjusting the Display

2.1 Introduction

This chapter provides information and instructions to get you started using your display. It will help you to become familiar with the display and the functions of the controls before you start using the unit. More detailed information on operating the radar display is provided in *Chapter 3* and *Chapter 4*.

Conventions Used

Throughout this handbook, the dedicated (labelled) keys are shown in bold capitals; for example, **MENU**. The soft key functions, menu names and options are shown in normal capitals; for example, SCREEN.

Operating procedures, which may consist of a single key-press or a sequence of numbered steps, are indicated by a ➤ symbol in the margin.
When the procedure requires you to press a soft key, the soft key icon is shown in the margin.

Simulator

The display unit includes a simulator function, that allows you to practice operating your radar without data from the scanner or GPS system. You will need to use the set up options to switch the display to simulator mode, as described in *Section 2.2*. You can use it in either of two ways:

- Before the display unit has been installed on your vessel. In this case, you only need to connect the display to a 12V or 24V DC power supply, connecting the red core from the power lead to positive (+) and the black core to negative (-). See *Chapter 6* for full details.
- After the display has been installed on your vessel, but while in the marina or at anchor.

The following section, *Section 2.2*, includes instructions to view simulated radar images.

2.2 Switching the Display On and Off

This section explains how to switch the radar display and scanner on and off, and how to switch the scanner between Transmit, Standby and Scanner Off mode.

You normally operate your radar in transmit mode, but you can use the display unit without the scanner operating as follows:

Standby mode: You should use this mode when you are not operating the radar for short time periods. The scanner does not transmit and the antenna does not rotate, so the radar uses less power. However, the scanner remains powered so when you return to transmit mode, the magnetron does not need to warm up.

Scanner off mode: You should use this mode when you do not require the radar, but you are using the display unit say, to view data from another source. Scanner off mode removes power from the scanner.

➤ To switch the display on, press and hold the **POWER** key until the unit beeps. The keys light up, the display shows the Pathfinder graphic, followed by the start-up information illustrated below, and the radar starts the magnetron warm-up sequence.

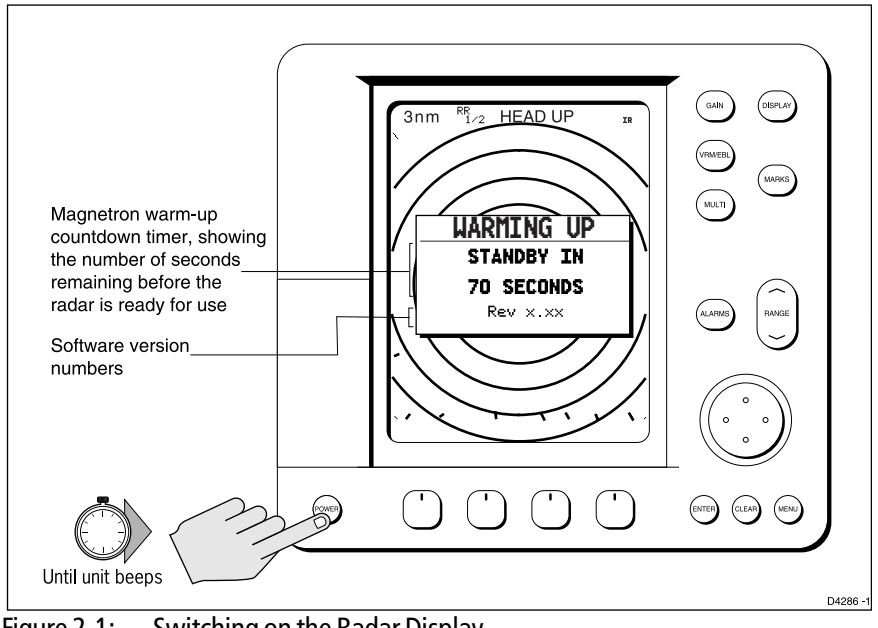


Figure 2-1: Switching on the Radar Display

After 70 seconds, when the magnetron warm-up sequence is complete, the Standby screen is displayed, with the text STANDBY and a prompt to press the **POWER** key to enter Transmit mode.

➤ To switch the radar scanner from Stand-by mode to Transmit mode, press the **POWER** key.

The scanner transmits pulsed energy while it rotates, and the antenna sweep builds up the radar picture using echoes returned from targets.

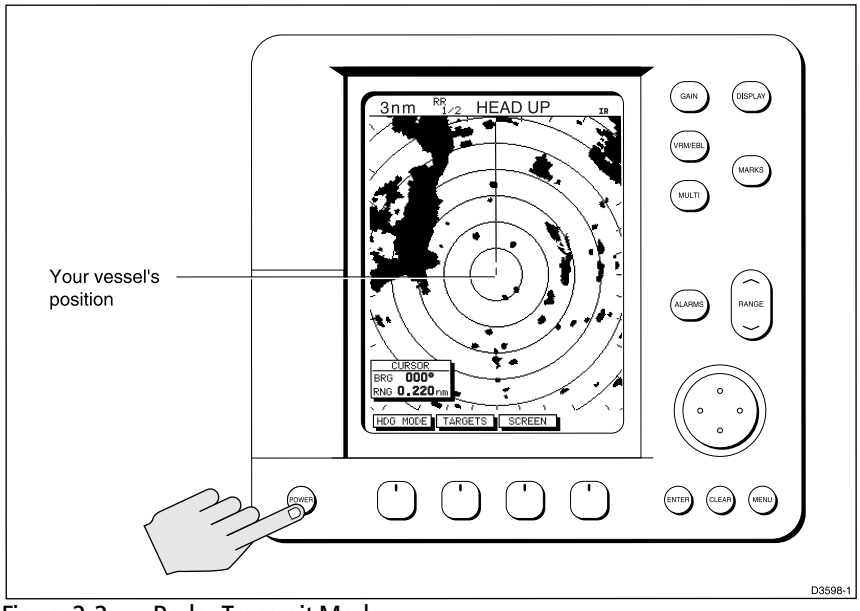


Figure 2-2: Radar Transmit Mode

➤ You can switch on and adjust the display backlighting and, on the mono display, contrast as described later in this chapter.

➤ To switch to Stand-by mode, press the **POWER** key.
The display returns to the Stand-by screen, and the scanner transmission and rotation stops.

➤ To use Scanner off mode:

1. Ensure that the radar is in Standby mode, warming up, or displaying a message that radar data is not available.
2. Press the **CLEAR** key. The message STANDBY. RADAR DATA NOT AVAILABLE appears in the radar picture. The scanner is powered down and the timer, if running, is cleared.

To return to radar operation, press the **POWER** key. The warm-up countdown is displayed and the radar goes into Standby mode. You press **POWER** again to switch to Transmit mode when required.

CAUTION:
To provide protection against the damaging effects of UV light, it is advisable to replace the sun cover provided when the color LCD display is not in use.
A reminder is displayed when you switch off the color LCD display.

➤ To switch the scanner and display unit off, press and hold the **POWER** key for three seconds. A countdown timer is displayed as shown below:

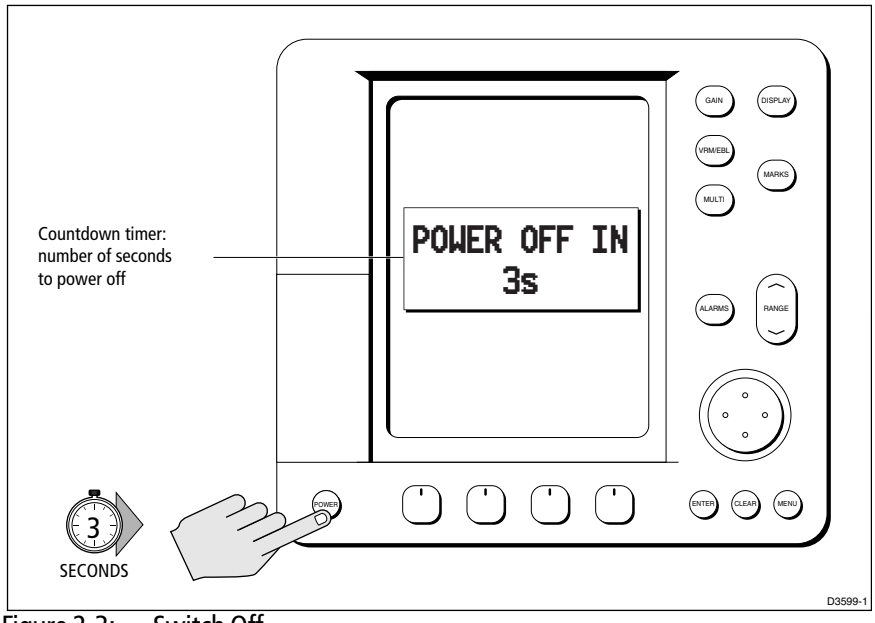


Figure 2-3: Switch Off

When the counter reaches zero a beep sounds, and the display unit switches off. Release the **POWER** key.

Note: *Switch the display unit off before you remove the power cord.*

Note: *You do not need to change to Standby mode before turning off the display: if you turn the radar display off while it is in Transmit mode, the scanner is also de-activated.*

Simulator Mode

When simulator mode is on a simulator data box is displayed.

When the display is switched off then on again, simulator mode is maintained. It is recommended that you select the System Set Up Menu and switch off simulator mode when you have finished.

➤ To view a simulated image:

1. Press **MENU** followed by the SYSTEM SET UP soft key.
   The set up menu pop-up is displayed.

2. Use the trackpad to move the selection bar over the option SIMULATOR. The simulator soft keys are displayed.
3. In the system set up menu, press RADAR to view a simulated radar image, DATA to view simulated numerical data and waypoint display, or BOTH to view simulated radar data.
4. Press **ENTER** twice to return to the default display.

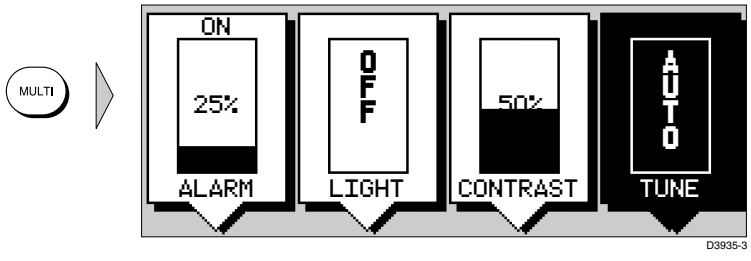
Changing the Lighting & Contrast - SL70M Mono Display

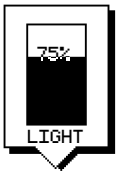
You can change the level of backlighting and contrast for the screen and keys. The key lighting is set the same as the screen lighting, except that it remains switched on at its lowest level even when the screen lighting is turned off, so that you can always find the keys.

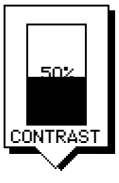
➤ To change the lighting and contrast:

1. Press the **MULTI** key to display the soft key controls:
   The last-used soft key is highlighted in inverse video (white text on a black background).

   If you press **MULTI** during the magnetron warm-up sequence countdown, only the LIGHT and CONTRAST sliders are displayed, and the lighting is automatically switched on at its last-used level.







2. To select a control (if it is not already highlighted) press the soft key. Alternatively, you can press the trackpad left and right edges to move sideways between the controls to select the soft key.
3. If necessary, press the soft key to toggle the control ON/OFF.
4. Use the trackpad (up or down) to increase or decrease the setting (between 0 and 100 in 1% steps). You can press and hold the trackpad to change the setting more rapidly. The lighting/contrast level is adjusted as you change the setting.
5. Press **ENTER** to remove the soft key sliders and return to the default screen, with the new lighting and contrast levels retained, or press **CLEAR** to discard the changes and return to the default screen.

If lights are left ON when you switch off the display, the next time the display is switched on, the lights will be ON, but at the default setting of 40%. The new

contrast level is retained until you reset it, unless you set the control very low or very high; in this case, the contrast will be restored as follows:

Contrast set < 30% restored to 30%
Contrast set > 70 % restored to 70%

Changing the Brightness - SL70C Color Display

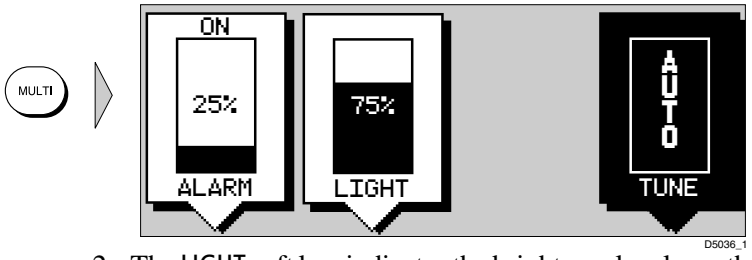
The **MULTI** key on the color LCD display is used to adjust brightness. The brightness of the screen can be adjusted over a wide range, suitable for viewing in daylight (high brightness level) or at night (low brightness level).

The key lighting is automatically adjusted as you alter the screen lighting, so that you can always find the keys. If you set the backlight to a high level, the key lighting is dimmed; if you set the backlight to a low level, the key lighting level is increased.

Adjusting the Brightness

➤ To change the screen brightness:

1. Press the **MULTI** key to display the soft key controls :



2. The LIGHT soft key indicates the brightness level, use the trackpad (up or down) to increase or decrease the setting. You can press and hold the trackpad to change the setting more rapidly. The brightness level is adjusted as you change the setting.
3. Press **ENTER** to return to the default screen, with the new brightness level.

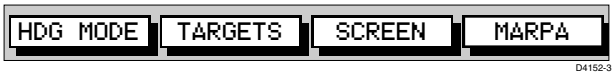
➤ To set the screen brightness to 100%:
Press and hold the **MULTI** key for one second. The brightness is increased to 100%.

The brightness level is retained when you switch off the display.

Note: *During night-time use, the brightness may be set very low, when subsequently operated during the day it may not be apparent that the display is on; press* **MULTI**, *followed by the second soft key from the left, then use the trackpad to increase brightness. Alternatively, press and hold* **MULTI** *for one second to set the brightness to 100%.*

2.3 Controlling the Display

You control the display using the cursor and control keys. You start all operations from the default screen, that is the default soft keys are displayed:



When you have completed an action using the soft keys, press **ENTER** or **CLEAR** to return to the default screen; you may need to press **ENTER** or **CLEAR** several times to back-track through the soft key hierarchy.

Note: *If you have set up your system so that the default soft keys are not displayed all the time, press any soft key to display the labels.*

The remainder of this section describes how to select the mode of operation and switch half-screen windows on/off. The following sections describe how to set up the display for the Radar.

The controls are summarized in the fold-out illustration on page 2.8.

Selecting a Half-Screen Window for Display

➤ To select a window for display:

1. Press the **DISPLAY** key. The following soft keys are displayed with an image of each available window:

SL70M Mono Display:

SL70C Color Display:

2. To select a different window, press either SELECT WINDOWS soft key until the required window is highlighted. If necessary, this will toggle windows on. Press **ENTER**.
3. To toggle windows off, press the WINDOWS OFF ON soft key.

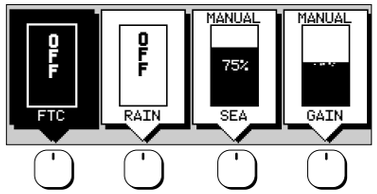
Figure 2-4 shows the half-screen horizontal windows.

Returning to the Full-Screen Display

To return to the full-screen display you can turn windows off, as previously described. Alternatively, to return to full-screen display:

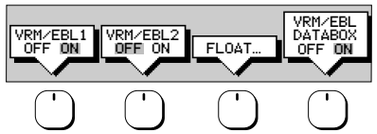
➤ Press and hold the **DISPLAY** key for 2 seconds to return to the currently selected full-screen (upper window) display.

GAIN Controls display adjustments.
GAIN controls for background noise (speckle).
SEA controls sea clutter.
RAIN controls rain clutter around the vessel.
FTC controls rain clutter at a distance.
- Press for soft keys display.



Select a slider using the soft key or trackpad.
Toggle between Auto/Man or off/on by pressing soft key again.
Adjust slider using trackpad, and press **ENTER** to finish.

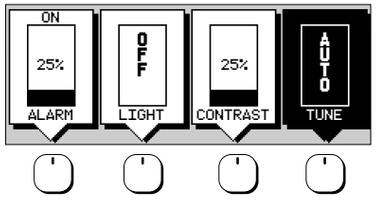
VRM/EBL Used to measure range and bearing to/between targets.
- Press to place VRM/EBL if one not already placed.
Adjust position using trackpad, and press **ENTER** to finish.
- Press to display soft keys if VRM/EBL already placed.



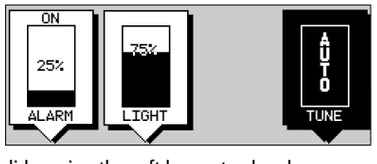
Use soft key to toggle VRM/EBL on or off.
Press FLOAT to access float options for existing VRM/EBL.
Press VRM/EBL DATABOX to toggle data box display off/on.

MULTI Controls guard zone alarm sensitivity, and tuning the receiver. Also controls display lighting and contrast (monochrome) or brightness (color).
- Press to display sliders.

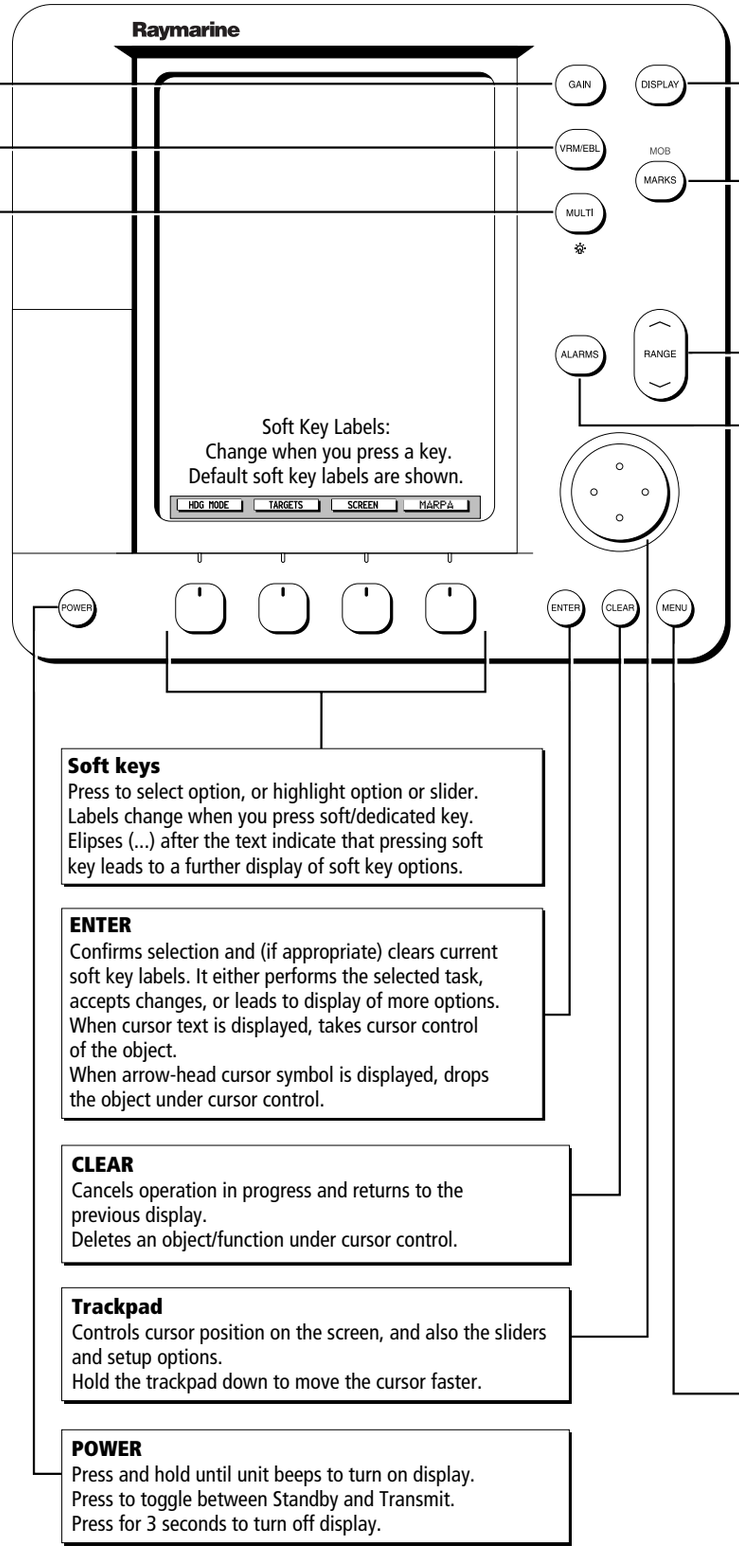
Monochrome



Color - Press and hold MULTI key for brightness to 100%.



Select a slider using the soft key or trackpad.
Toggle between Auto/Man or off/on by pressing key again.
Adjust slider using trackpad, and press **ENTER** to finish.



Soft keys
Press to select option, or highlight option or slider.
Labels change when you press soft/dedicated key.
Elipses (...) after the text indicate that pressing soft key leads to a further display of soft key options.

ENTER
Confirms selection and (if appropriate) clears current soft key labels. It either performs the selected task, accepts changes, or leads to display of more options.
When cursor text is displayed, takes cursor control of the object.
When arrow-head cursor symbol is displayed, drops the object under cursor control.

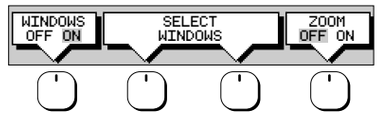
CLEAR
Cancels operation in progress and returns to the previous display.
Deletes an object/function under cursor control.

Trackpad
Controls cursor position on the screen, and also the sliders and setup options.
Hold the trackpad down to move the cursor faster.

POWER
Press and hold until unit beeps to turn on display.
Press to toggle between Standby and Transmit.
Press for 3 seconds to turn off display.

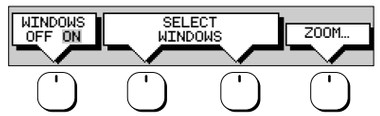
DISPLAY Controls display mode windows.
- Press for display mode and soft keys display.
- Press again to toggle through display modes, then **ENTER**.
- Press and hold for 2 seconds for full page radar display.

Monochrome



Press soft key to toggle window on/off, or return to full screen.
Zoom: Move Zoom box using trackpad, press **ENTER** to finish.

Color

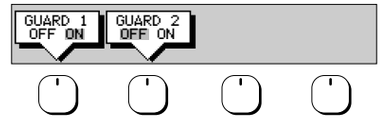


Press soft key to toggle window on/off, or return to full screen.
Zoom: Press ZOOM key to display zoom window options.
Move Zoom box using trackpad, press **ENTER** to finish.

MARKS / MOB Controls placing marks, and Man Overboard function.
- Press to place mark at cursor position, and use trackpad to move mark. Press **ENTER** to finish.
- Press and hold for 2 seconds to activate or cancel MOB.

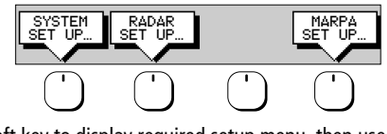
RANGE Controls range scale. Range scale and range rings are shown in the Status Bar.
- Press top of key to increase the range scale.
- Press bottom of key to decrease the range scale.
- Press and hold to change the scale faster.

ALARMS Used to control guard zones.
- Press to display soft keys.



Use soft key to toggle zone on or off.
Adjust size/shape using trackpad, press **ENTER** to finish.

MENU Provides access to setup options.
- Press to display soft keys.



Press soft key to display required setup menu, then use trackpad to select option and soft key to change setting.
Press **ENTER** to close menu, and **CLEAR** to to finish.

D3994-6

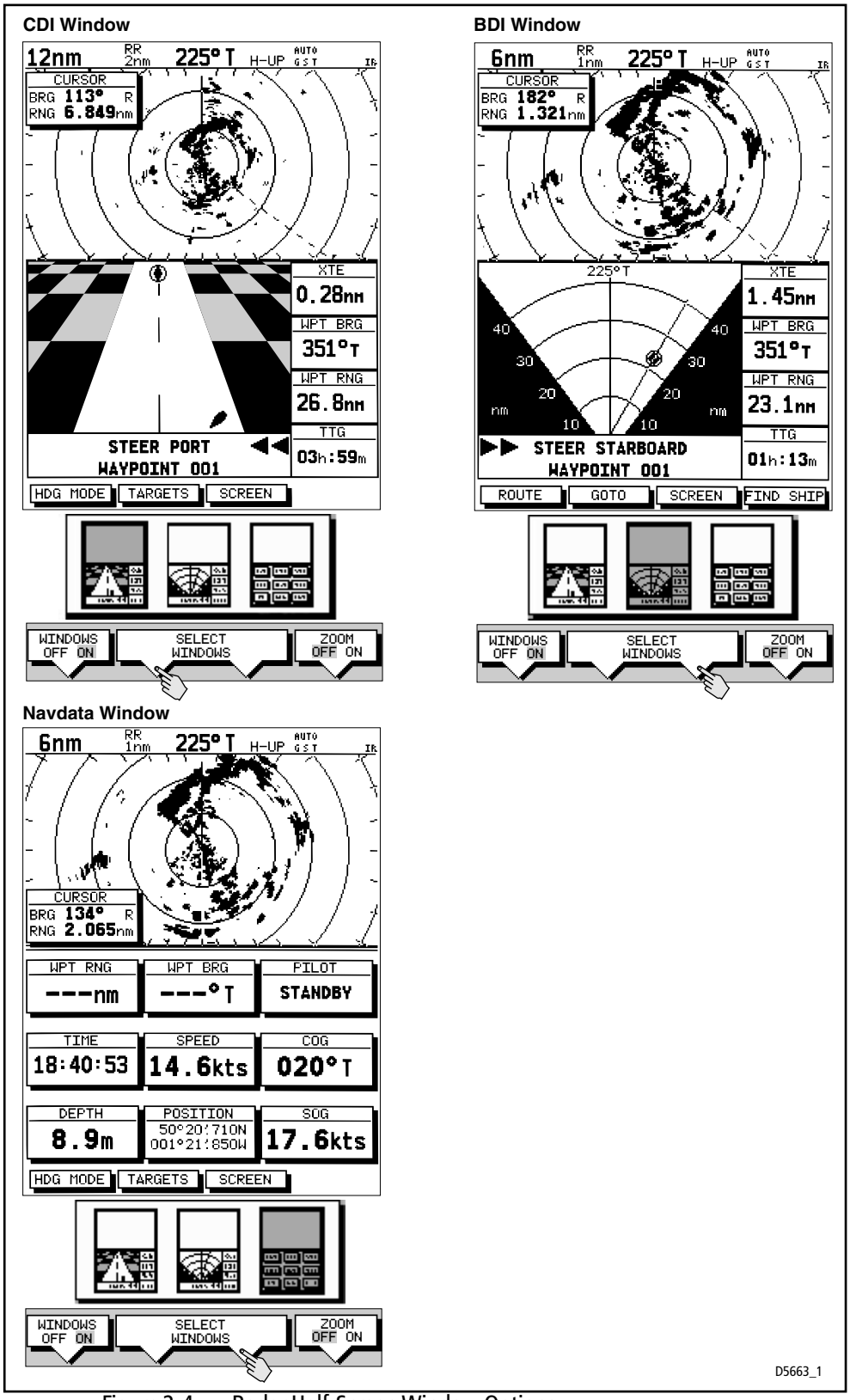


Figure 2-4: Radar Half-Screen Window Options

Customizing the Screen Presentation Options

The SCREEN soft key lets you switch the following screen presentation options on or off:

Switching the Cursor Data Box On and Off

The cursor data box provides the cursor's position in latitude/longitude and/or bearing/range. If you wish to see a full image, you can switch the data box off.

➤ To control the cursor data box:

1. Press the SCREEN soft key.

2. Press the CRSR BOX soft key to toggle the setting from OFF to ON or from ON to OFF.
3. To return to the default soft key display, press **ENTER**.

➤ You can use the context sensitive cursor to select and move the cursor data box (the label BOX is displayed). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*

Switching Radar Range Rings On and Off

The radar range rings can be turned on or off. They are normally left on, but you may wish to turn them off if you are using VRM/EBLs or guard zones (see *Section 3.4* and *Section 3.5*) to make the display clearer.

➤ To turn the range rings on or off:

1. Press the SCREEN default soft key.

2. Press the RANGE RINGS soft key to toggle the setting from OFF to ON or from ON to OFF.

To return to the default soft key display, press **ENTER**.

Data Boxes

A group of up to six data boxes can be displayed, if the information is available on your system. **You select which data is displayed in the boxes during system set up as described in *Chapter 5:Setting Up the System Defaults*.**

The default data box positions are along the bottom of the display. Each box can be moved to the required position on the screen using the context-sensitive cursor.

Note: *If you select BDI, CDI or Nav Data for display in a half-screen window, the data boxes are temporarily hidden.*

SCREEN

At any time, you can switch the *group* of data boxes on or off using the SCREEN soft key. When first installed, the boxes are all OFF. When the display unit is switched off and on again, the data boxes return to their last-used states (ON or OFF) and positions.

Note: *The* SCREEN *soft key does not control the nine or sixteen data boxes that can be displayed in the half-screen window.*

➤ To switch the group of data boxes on or off:

SCREEN

1. Press the SCREEN default soft key.

DATABOXES OFF ON

2. Press the DATABOXES soft key to toggle the setting from ON to OFF or from OFF to ON.

To return to the default soft key display, press **ENTER**.

If you turn the data boxes on and none are displayed, you need to select the ones you require using the system set up menu, as described in *Section 5.3, System Set Up Parameters*.

BOX

➤ You can use the context sensitive cursor to select and move any data box (the label BOX is displayed). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*

Waypoint Display

If you are currently going to a waypoint, you can display the active waypoint on the radar picture. The waypoint may have beenreceived via the SeaTalk or NMEA interface.

➤ To display the active waypoint:

SCREEN

1. Press the SCREEN soft key.

WAYPOINT OFF ON

2. Press the WAYPOINT soft key to toggle the setting ON.

To return to the default soft key display, press **ENTER**.

The standard radar picture is displayed again, with the active waypoint joined to your vessel's position by a dotted line. If the waypoint is off-screen, the dotted line is extended to the edge of the radar picture.

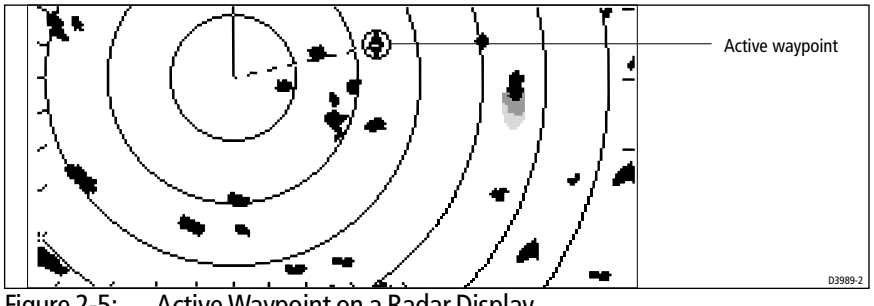


Figure 2-5: Active Waypoint on a Radar Display

2.4 Radar Display Control Functions

This section describes how to use the radar controls to:

- Use the zoom function to enlarge a selected area.
- Offset the center of the radar display.
- Momentarily hide the ship's heading marker (SHM).

Using the Zoom Function - SL70M Mono Display

If you wish to see a section of the radar picture in more detail, you can use the Zoom function to magnify the selected area to twice its size. The enlarged area is displayed in a quarter-screen Zoom Window in the lower right corner of the screen. A box in the original radar picture indicates the enlarged area; you can move this using the context-sensitive cursor, changing the image in the Zoom Window.

Note: *If the area you wish to enlarge is in the quarter of the screen that will be covered by the Zoom Window, you should offset the centre (see the next section) to move the area to another part of the screen before selecting Zoom mode.*

Note: *You cannot use Zoom and Windows at the same time: if you turn one on, the other is turned off automatically, and restored when the first is turned off again.*

➤ To enlarge an area:

1. Press the **DISPLAY** key. The soft keys are updated.

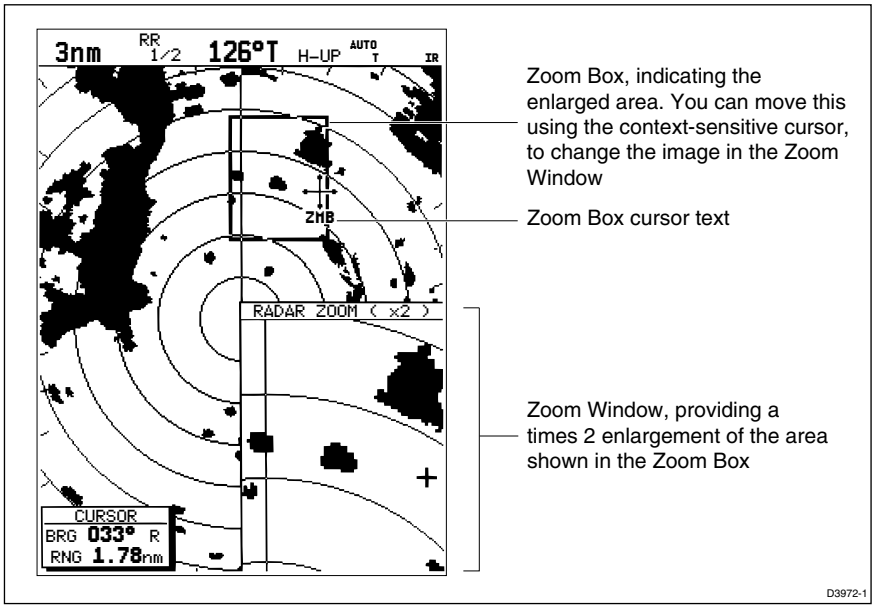
2. Press the ZOOM soft key to toggle the Zoom function ON.

   The labels are cleared, and the cursor has control of the zoom box that indicates the area to be enlarged. This is indicated by the letters ZMB in inverse video, and the four-headed cursor symbol. The zoom box defaults to its last-used position since power-on.

3. Use the trackpad to move the zoom box to the required area, and press **ENTER**.

   The selected area is shown in an enlarged format in the quarter-screen Zoom window. The original radar picture occupies the rest of the screen.

➤ You can use the context sensitive cursor to select and move the enlarged area in view in the window (the label ZMB is displayed). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.



➤ To return to the normal display, press **DISPLAY** and then press the ZOOM soft key to set the function OFF.
Alternatively, you can press and hold **DISPLAY** for 2 seconds. This also removes any grouped data boxes.

Using the Zoom Function - SL70C Color Displays

If you wish to see a section of the radar picture in more detail, you can use the Zoom function to magnify the selected area to twice its size. There are two zoom options:

- **Zoom Into** - The enlarged area is displayed in a quarter-screen Zoom Window in the lower right corner of the screen. A box in the original radar picture indicates the enlarged area; you can move this using the context-sensitive cursor, thereby changing the image in the Zoom Window.

Note: *If the area you wish to enlarge is in the quarter of the screen that will be covered by the Zoom Window, you should offset the center (see the next section) to move the area to another part of the screen before selecting Zoom mode.*

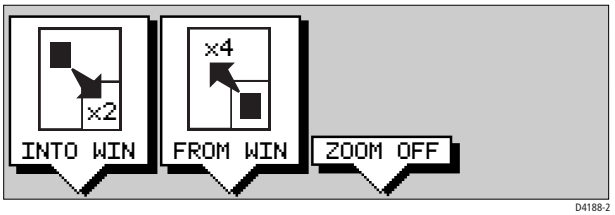
- **Zoom From** - The enlarged area is displayed in the main window, with the original radar picture in a quarter-screen window in the lower right corner of the screen. A box in the original radar picture indicates the enlarged area; you can move this using the context-sensitive cursor, thereby changing the zoomed image.

Note: *You cannot use Zoom and Windows at the same time: if you turn one on, the other is turned off automatically, and restored when the latter is turned off again.*

➤ To enlarge an area:

1. Press the **DISPLAY** key. The soft keys are updated.

2. Press the ZOOM soft key to display the following soft keys



3. Press the required zoom option soft key, INTO WIN or FROM WIN.
   The soft keys are cleared, and the cursor has control of the zoom box that indicates the area to be enlarged. This is indicated by the letters ZMB in inverse video, and the four-headed cursor symbol. The zoom box defaults to its last-used position since power-on.
4. Use the trackpad to move the zoom box to the required area, then press **ENTER**. The selected area is shown in enlarged format, either in the quarter-screen Zoom window (INTO WIN) or in the main window (FROM WIN).

Press **DISPLAY** then **ENTER** to exit the Zoom mode.
Alternatively, you can press and hold **DISPLAY** for 2 seconds.

➤ You can use the context sensitive cursor to select and move the enlarged area in view in the window (the label ZMB is displayed). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.

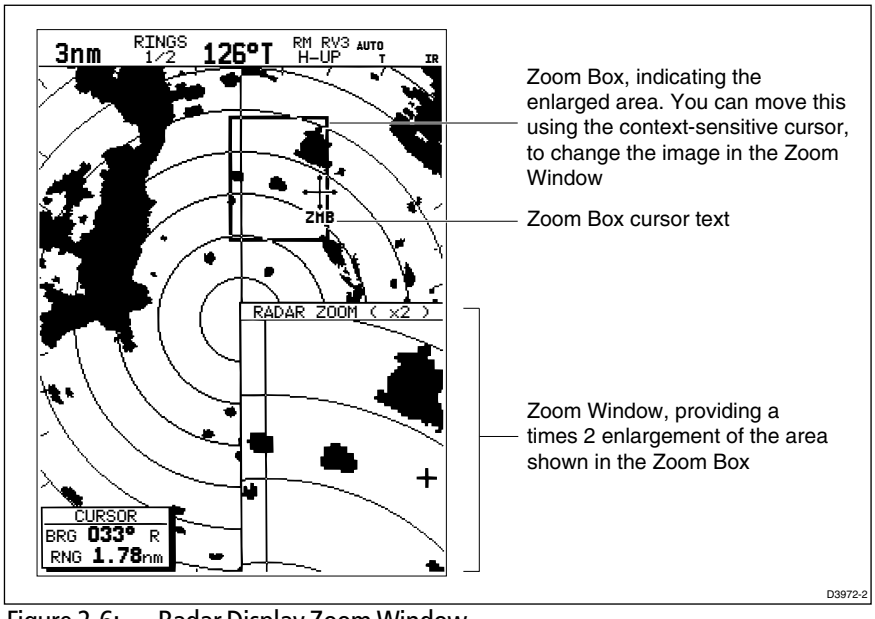

3nm
RINGS 1/2
126°T
RM RV3 AUTO
H-UP
T
IR
ZMB
RADAR ZOOM (×2)
CURSOR
BRG 033° R
RNG 1.78nm
Zoom Box, indicating the enlarged area. You can move this using the context-sensitive cursor, to change the image in the Zoom Window
Zoom Box cursor text
Zoom Window, providing a times 2 enlargement of the area shown in the Zoom Box
D3972-2

Figure 2-6: Radar Display Zoom Window

Offsetting the Center

The radar picture is normally shown with your vessel at the center of the display. However, you can move the center, so that your vessel is offset by up to 66% of the radius, anywhere on the screen.

Note: *You cannot offset the center when the radar display is set to the longest range scale.*

➤ You use the context sensitive cursor to select and move the center of the radar picture (the label CTR is displayed). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.

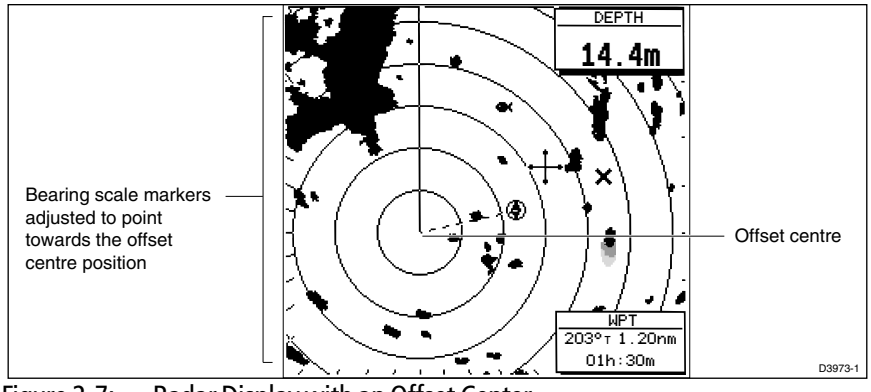


Figure 2-7: Radar Display with an Offset Center

➤ To return the center of the radar picture to the center of the screen, select the center point (CTR) then press the **CLEAR** key. The center is always reset to the center of the display when you turn on the Radar display.

Note: *When the center is offset, additional range rings are displayed to the edge of the radar picture, at the standard ring interval for the current range. If you have selected the longest range scale, you cannot offset the center.*

Hiding the Ship's Heading Marker (SHM)

The radar picture includes the ship's heading marker, which is a line from your vessel's position to the edge of the picture at the vessel's current heading. In the standard Head Up mode, the heading marker is always a vertical line.

If you wish to check for small targets that may be hidden under the heading marker, you can hide it momentarily using the context-sensitive cursor.

➤ To hide the heading marker:

1. Position the cursor over the heading marker, so that the text SHM is displayed.
2. Press and hold **CLEAR**. The heading marker is hidden until you release the **CLEAR** key.

Chapter 3: Standard Radar Operations

3.1 Introduction

This chapter provides detailed instructions for the standard operations of your Pathfinder radar. Additional functions, that are available on integrated systems with appropriate data sources, are described in *Chapter 4*.

You can use this chapter with the radar display set to simulator mode, or on the water after you have installed and set up your Pathfinder system.

This chapter covers the following topics:

- Range control.
- Interpreting and adjusting the radar picture, including adjusting the gain, sea clutter and rain clutter, changing the targets display, and tuning the radar.
- Measuring range (distances) and bearings using Variable Range Markers (VRMs) and Electronic Bearing Lines (EBLs).
- Setting up guard zones and handling alarms.

Note: *Until you are familiar with interpreting the radar display, you should take every opportunity to compare the radar's display patterns with visual targets, such as other vessels, buoys and coastal structures. You should practice harbour and coastal navigation during daylight and in clear weather conditions.*

If you have a system with any chart display connected via SeaTalk you can identify objects using the cursor echo feature: With cursor echo on (see *Section 4.5* and *Chapter 5*) you can select an object on the radar display, the cursor is repeated on the chart display so you can check the object's identity.

3.2 Range Control

The radar picture can be viewed at various scales. The shortest range scale gives a maximum range of 1/8 nautical miles, measured from the default centre to the top of the radar picture. The longest range scale gives a maximum range of between 24 and 72 nautical miles depending on your scanner.

- The *long* range scales provide the best overview of your vessel's relationship to land masses, weather fronts and large ship targets in or beyond view.
- The *short* range scales provide greater detail of the radar echoes close to your vessel, and should be used as you approach the coastline, harbour or other vessels in the area.

The Pathfinder Plus Radar display includes concentric range rings, which you can use to help you to judge distances on the radar picture. Their number and spacing are adjusted automatically if you change the range scale. They can be turned off (see *Switching Radar Range Rings On and Off* on *page 2-10*).

The Standard Range Scale

Details of the standard ranges that can be selected are shown in the table below. If you wish, you can customize the range scales by specifying different ranges, as described in *Section 5.4, Radar Set Up Parameters*.

Table 3-1: Radar Range Scales

Maximum Range (nm)	Number of Range Rings	Range Ring Interval (nm)
0.125	2	0.0625
0.25	2	0.125
0.5	4	0.125
0.75	3	0.25
1.5	6	0.25
3	6	0.5
6	6	1
12	6	2
24*	6	4
48*	6	8
72*	6	12

* The maximum range depends on your scanner type, as detailed in the *Pathfinder Plus Radar Scanner Owner's Handbook*.

The number of range rings shown in the table is the number to the selected range. Additional range rings are displayed to the edge of the radar picture, at the standard ring interval for the current range, and are visible when the centre is offset.

Changing the Range

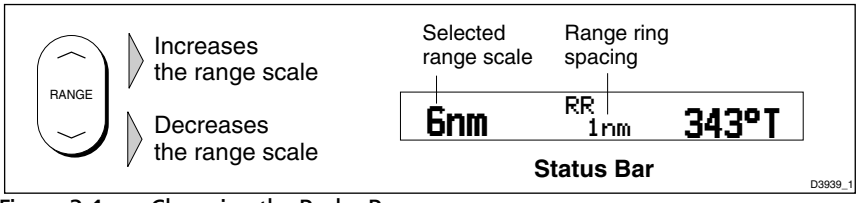


Figure 3-1: Changing the Radar Range

➤ Each time you press the **RANGE** key, the range changes to the next available setting. The system will beep three times if no further range scale is available.

➤ To change the range quickly, press and hold the required arrow on the **RANGE** key.

The range scale and range ring interval indicators, at the left-hand end of the status bar, are updated whenever you change the range.

Determining Actual Radar Range

The actual maximum radar range is essentially line-of-sight, and is limited by the height of the scanner and the height of the target as shown in *Figure 3-1*. *Table 3-2* lists some range examples:

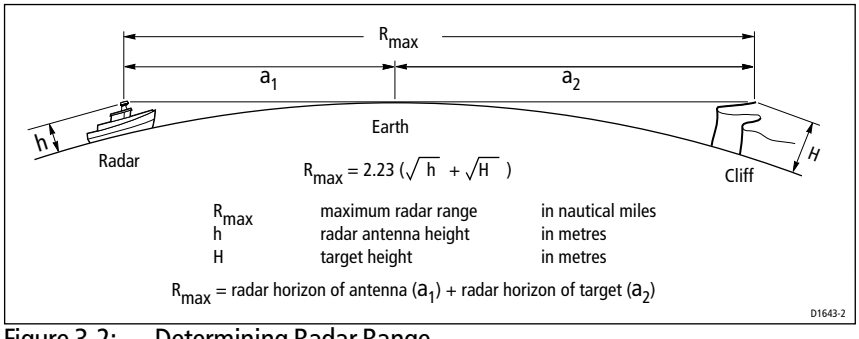


Figure 3-2: Determining Radar Range

Table 3-2: Radar Range

Antenna Height (m)	Target Height (m)	Maximum Range (nm)
3	3	7.8
3	10	10.9
5	3	8.9
5	10	12.0

Note: *The ranges shown in the table are theoretical maximum ranges. The radar horizon is greater than the optical horizon, but the radar can only detect targets if a large enough target is above the radar horizon.*

3.3 Interpreting and Adjusting the Radar Picture

Navigational echoes may be large, small, bright or faint, depending not only on the size of the object but also on its orientation and surface. Different objects reflect the radar signals in different ways. For example, vertical objects such as cliffs reflect signals better than sloping ones such as sandbanks.

High coastlines and mountainous coastal regions can be observed at the longest radar range. However, the first sight of land may be a mountain several miles inland from the coastline. The actual coastline may not appear on the radar until the vessel is close to the line of sight distance.

The radar indication may not be similar to your visual observation; a nearby small object may appear to be the same size as a distant large object on the radar. However, with experience the approximate size of different objects can be determined by the relative size and brightness of the echoes.

Some targets, such as buoys and small boats, can be difficult to differentiate, since they bob and toss about in the waves and do not present a consistent reflecting surface. Consequently, these echoes have a tendency to fade and brighten and, at times, to disappear momentarily. Buoys and small boats often resemble each other, but boats can usually be distinguished by their motion.

Not all radar echoes are produced by hard navigational items. Some echoes may be received from irregularities on the surface of the water, particularly at close range (sea clutter), or from rain or snow either around the vessel or in the distance. In addition, some echoes may be indirect returns to the radar scanner, providing false echoes or multiple echoes.
The effects of many false echoes can be minimized, and the target presentation clarified using the controls summarized below. This section explains how to interpret the radar picture and how the controls affect the display. It provides instructions for adjusting the settings, describes the circumstances in which they should be adjusted, and how they interact with each other.

Table 3-3: Controls to Adjust the Radar Picture

Control	Option	Function	Default Setting
GAIN	GAIN	Controls the strength of the target returns	AUTO
	SEA	Reduces sea returns	AUTO-HARBOUR
	RAIN	Reduces close rain or snow returns	OFF
	FTC	Reduces distant rain or snow returns	OFF
MULTI	TUNE	Fine tunes the receive	AUTO
TARGETS	INT REJ	Turns interference rejection on/off	ON
Soft Key	EXPANSION	Turns target expansion on/off	OFF
	WAKES	Turns wakes on/off and selects wakes length	OFF

Identifying False Echo Returns

Not all echoes are direct returns to the radar antenna. Occasionally signals appear at positions where there is no actual target. These are called *false echoes*, and may be caused by side lobes, ghost images, indirect echoes or multiple echoes.

This section briefly describes the echo patterns that can be produced by false echoes and the likely cause. It should be noted that the radar operator, through observation, practice, and experience, can generally detect these conditions very quickly. These effects can usually be minimized using the radar controls.

Side Lobes

A small part of the RF energy from each transmitted pulse is radiated outside the single narrow beam. This produces side lobe patterns, shown in *Figure 3-3*.

Side lobes have no effect on distant or small surface objects. However, the echo from a large object at short range may produce an arc on the radar screen similar to a range ring or a series of echoes forming a broken arc. Side-lobe echoes normally occur at ranges below 3nm, and can be reduced by adjusting the SEA control.

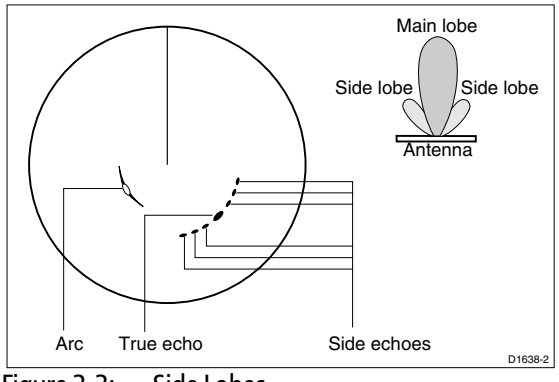


Figure 3-3: Side Lobes

Indirect Echoes

There are several types of indirect echoes or ghost images - some examples are shown in *Figure 3-4*. These sometimes have the appearance of true echoes, but in general they are intermittent and poorly defined.

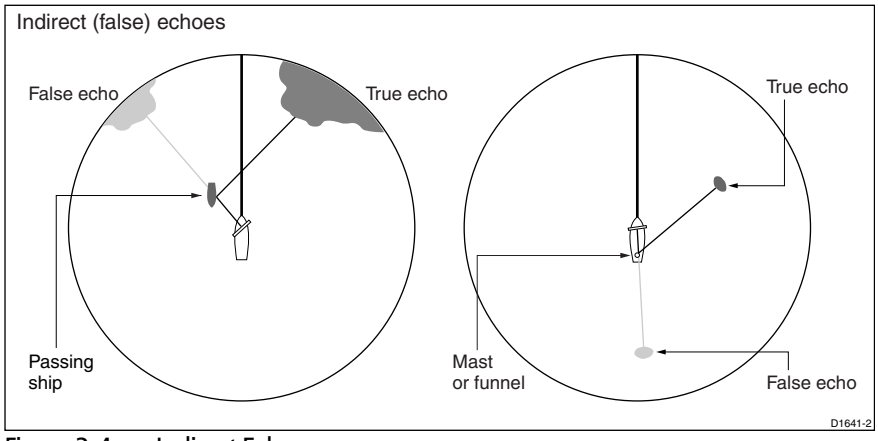


Figure 3-4: Indirect Echoes

Multiple Echoes

Multiple echoes appear if there is a large target with a wide vertical surface at a comparatively short range. The transmitted signal will be reflected back and forth between the target and your own ship. Multiple echoes therefore appear beyond the true target's echo on the same bearing, as shown in *Figure 3-5*. This is not very common.

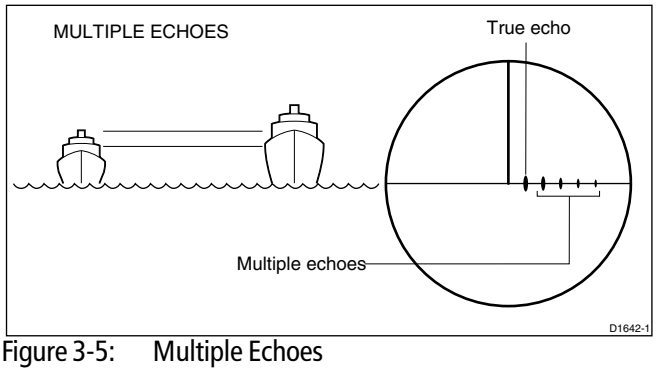


Figure 3-5: Multiple Echoes

Blind Sectors or Shadow Effect

Funnels and masts located near the antenna, may cause shadows. In shadow areas beyond the obstruction there will be a reduction of the beam intensity, although not necessarily a complete cut-off. However, there will be a blind sector if the subtended angle is more than a few degrees. There may also be multiple echoes which extend behind the obstruction. This should be avoided by careful selection of the scanner site prior to installation (*Chapter 6*).

Adjusting Gain, Sea Clutter, Rain Clutter and Tune

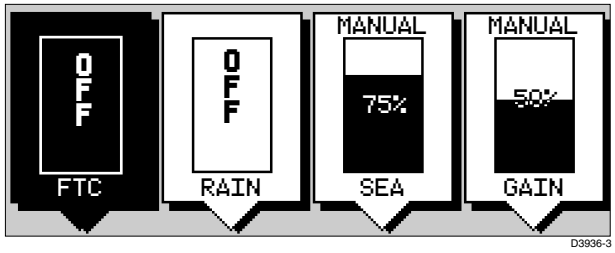
Automatic adjustment of Gain, Sea and Tune is available, alternatively you can set any of these parameters to manual and use the trackpad to adjust its value. Rain clutter is adjusted manually using the RAIN or FTC control. GAIN, SEA, RAIN and FTC are accessed from the **GAIN** key; TUNE is accessed from the **MULTI** key. **We recommend that you leave the** TUNE **control in Auto mode.**

GAIN

MULTI

Note: *Gain, Sea and Tune can only be adjusted if the control is set to Manual adjustment.*

GAIN



When you select manual GAIN, SEA or TUNE adjustment the soft key icon shows a vertical slider bar. As you press the trackpad, the value is indicated in the slider.
When you switch FTC or RAIN On, the soft key icon shows a vertical slider bar. As you press the trackpad, the value is indicated in the slider.

If you change the settings, the new GAIN, SEA and TUNE modes (auto or manual) and values remain set even when you turn the radar off and on again; Rain and FTC are reset to Off at power-on. The status bar indicates which controls are switched to Auto or On, as shown in *Figure 3-6*.

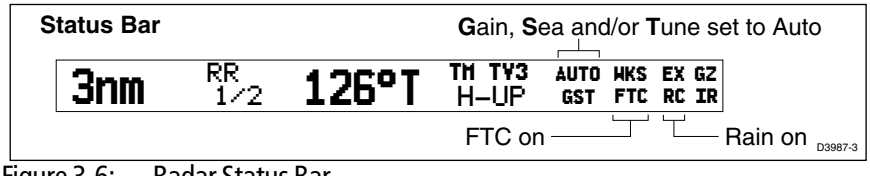


Figure 3-6: Radar Status Bar

➤ To adjust a parameter:

1. Select a range appropriate to the adjustment you wish to make. The optimum Tune setting varies slightly for different ranges, depending on the pulse width used.

GAIN

2. Press **GAIN** or **MULTI**. The slider soft keys are displayed. The last-used slider is highlighted (displayed in inverse video) to show that it is selected.

MULTI

3. Press the required soft key so that the slider box is highlighted.
   The TUNE and GAIN soft keys toggle the control between Auto and Manual mode. The SEA soft key toggles the control between Auto-Harbour, Auto-Offshore and Manual mode. If you select Manual mode the last auto setting is retained. You can only move the slider if the control is set to Manual.

4. Use the trackpad to move the slider up or down. You can press and hold the control to move the slider quickly rather than in single steps.
   The image on the screen changes as you move the slider, so that you can see the effect of your adjustment.
   If you select MANUAL TUNE adjustment, an 8-step signal-strength indicator bar is displayed above the slider. Adjust the slider to obtain the maximum reading on the indicator.

Note: *Because the changes to the settings are made immediately, you cannot revert to the previous setting by pressing* **CLEAR**.

5. When you have set all the controls to the levels you require, press **ENTER**, or **CLEAR** to clear the slider display. The status bar is updated to indicate which controls are switched to Auto or On.

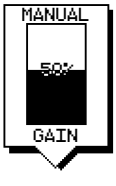
Gain Control and Sea Control

The GAIN control can be set to either Auto or Manual. In Auto mode, the Pathfinder Plus radar optimizes the setting. The SEA control can be set to Auto-Harbour (default), Auto-Offshore or Manual mode. In Auto-Offshore mode, the Pathfinder Plus Radar optimizes its settings to account for the effects of sea clutter. **In harbours or close proximity to land different auto settings may be necessary to cater for the effects of land clutter. To avoid losing small targets it is therefore advisable to set the Sea control to Auto-Harbour mode. Alternatively, set both Sea and Gain to Manual mode then adjust the settings to ensure that all close small targets are visible.**

The GAIN control adjusts the level of the display of signals received from the scanner; it is equivalent to a volume control on a radio.

Because the SEA control affects the gain, you may need to manually readjust it if you manually change the Gain setting.

Gain Control



When the GAIN control is set to Manual, you should check it every time you change the range scale.

On long range settings, the gain should be set to give a slight speckle in the background of the radar picture. Do not set the gain too low, or you may miss small or weak targets.

On shorter ranges, you may wish to reduce the gain slightly to reduce the speckle and therefore improve target definition.

Sea Clutter Control

Radar returns from waves around your vessel can clutter the centre of the radar picture (see *Figure 3-7*, making it difficult to detect real targets. Such *sea clutter* usually appears as multiple echoes on the display at short range scales, and the echoes are not repetitive or consistent in position. With high winds and extreme conditions, echoes from sea clutter may cause dense background clutter in the shape of an almost solid disc.

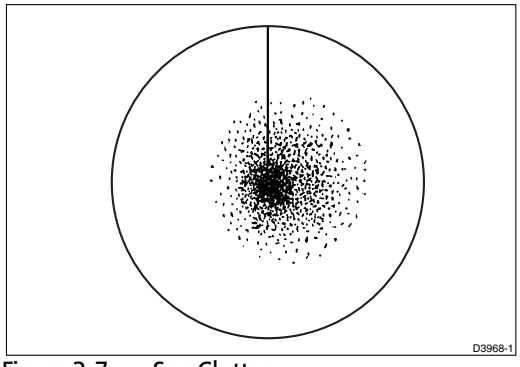


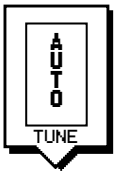
Figure 3-7: Sea Clutter

The SEA control reduces the gain level in the areas near your vessel, extending up to 3 to 5nm depending on the wave and sea conditions. This has the effect of reducing the sea returns to intermittent small dots, while small targets are still visible. Gain levels further from your vessel remain unchanged.

You can use the Gain and Sea control to help minimize the effects of side lobes (see *Identifying False Echo Returns* on *page 3-5*).

Note: *On short range scales, do not set the Sea control so high that all clutter is removed, since this could stop you seeing echoes from close targets.*

Tuning the Receiver



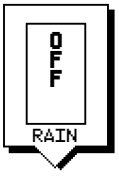
The TUNE control is used to fine tune the receiver in the scanner for maximum target returns on the display. In Auto mode, the radar tunes itself automatically on all range scales. **We recommend that you leave the TUNE control in Auto mode.**

If you do set the TUNE control to Manual, you will need to adjust it about 10 minutes after you have turned on the radar, since the required setting changes once the magnetron has warmed up.

You should adjust the control to obtain the maximum signal strength, as indicated in the 8-step bar above the slider. If you cannot tune the radar successfully, refer to *Section 5.6* for information on the Tune Preset function.

Rain Clutter Control, using RAIN and FTC

The radar can see echoes from rain or snow. Returns from storm areas and rain squalls consist of countless small echoes that continuously change size, intensity, and position. These returns, shown in *Figure 3-8*, sometimes appear as large hazy areas, depending on the intensity of the rainfall or snow in the storm cell.



The RAIN and FTC controls are used to reduce this clutter, so that targets masked by the clutter can be seen on the radar picture.

- The RAIN control is used to reduce large clutter masses around your vessel caused by rain or snow.
- The FTC (Fast Time Constant) control is used to reduce rain clutter at a distance from your vessel, such as that shown below.

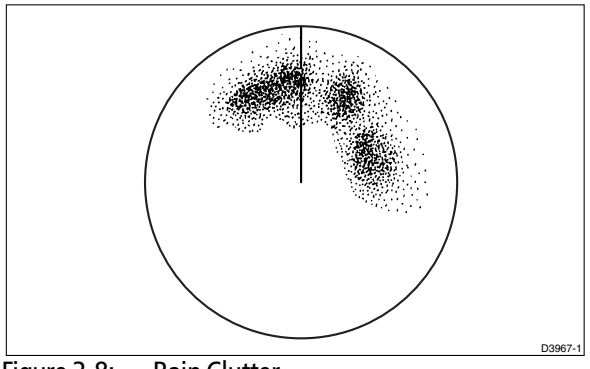
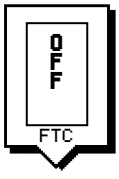


Figure 3-8: Rain Clutter



When the FTC control is turned up, only the leading edge of large (rain clutter) echoes is displayed, while the effect on smaller (ship) echoes is only slight. This means that you can also use the control on shorter ranges to distinguish between two very close echoes on the same bearing, which may otherwise merge and appear as one echo.

When the FTC control is turned up, the receiver is less sensitive, and there is a reduction of background noise and fill-in returns from land and large targets. You should therefore turn the control down when its use is not required. Since storm cells are usually visible for long distances due to their extreme altitude, you may wish to leave them displayed so that you can observe the location of bad weather.

If you turn the RAIN or FTC control Off (equivalent to setting the level to 0%), the actual setting is stored, and restored when you turn the control on again.

Note: RAIN *and* FTC *are reset to Off at power-on.*

Changing the Targets Display

The Pathfinder PLUS Radar allows you to improve target visibility by changing the following:

- Interference rejection
- Target expansion
- Target wakes

These parameters are accessed from the default soft key TARGETS.

This section explains how to change these modes and describes the effect of each mode. The current settings are shown at the right-hand end of the status bar as shown in *Figure 3-9*.

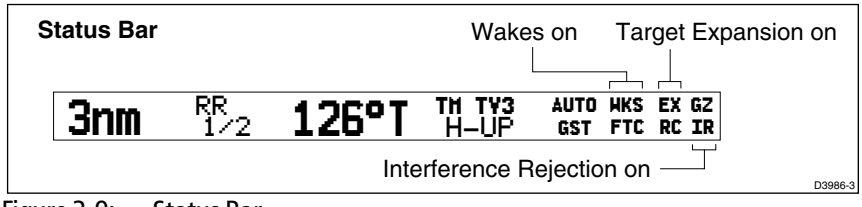


Figure 3-9: Status Bar

➤ To change the settings of the target modes:

1. Press the TARGETS default soft key.
   The target option soft keys are displayed, with the current selections highlighted.

2. Press the appropriate soft key to toggle the required setting between OFF and ON.

Note: *If an option is not available for the current setting, its soft key label is grey. When you press the key, the system beeps and the setting remains* OFF.

For the Wakes mode, press the WAKES soft key to step the highlighted selection through the wake options.

You can use the soft keys to change the settings of any or all the modes on this display.

3. When the required options are highlighted, press **ENTER**. The screen returns to the default display with the new mode(s) in operation. The status bar is updated to indicate which controls are switched on.

Interference Rejection

Mutual radar interference is likely when two or more radar-equipped vessels are operating within range of each other. This usually appears as a series of small dots moving to and from the display center in a straight line or a long, sweeping curve. This type of interference is most noticeable at long ranges.

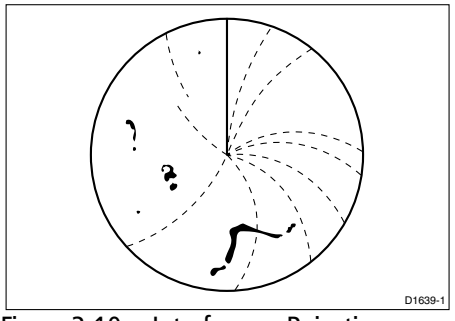


Figure 3-10: Interference Rejection

The Pathfinder Plus Radar includes a mechanism that automatically reduces such interference. This mechanism is normally left switched on. However, if you wish to detect the presence of other radars in the vicinity, you can turn off the interference rejection.

Target Expansion

You can make targets easier to see by expanding them. Target expansion uses a combination of signal processing techniques and pulse length override to increase the size of targets seen on the screen. However, this may compromise range resolution. Two levels of target expansion are available, with level 2 providing greater expansion than level 1.

Target Wakes

You can see the direction and speed with which targets are moving relative to your vessel by selecting the target wakes display option.

When wakes are switched on, the target is displayed at the brightest level and the previous positions of targets are retained at successively fainter levels on the screen. You can select long, medium or short wakes, which retain information from previous scans at a reduced video level.

You can clear existing wakes from the display by pressing the CLEAR WAKES soft key. The soft key is only available when wakes are switched on; the display starts showing new wakes as soon as the old wakes have been cleared.

When wakes are switched off, no new wakes are displayed and existing wakes are cleared.

3.4 Measuring Range and Bearing Using VRM/EBLs

The Pathfinder Plus Radar display allows you to specify up to two Electronic Bearing Lines (EBLs), each with an associated Variable Range Marker (VRM), using the **VRM/EBL** key.

A standard VRM is displayed as a circle with its centre on your vessel's position, and it's EBL is displayed as a line from the origin to the edge of the radar picture display. However, each pair can be *floated*, so that the origin can be moved.

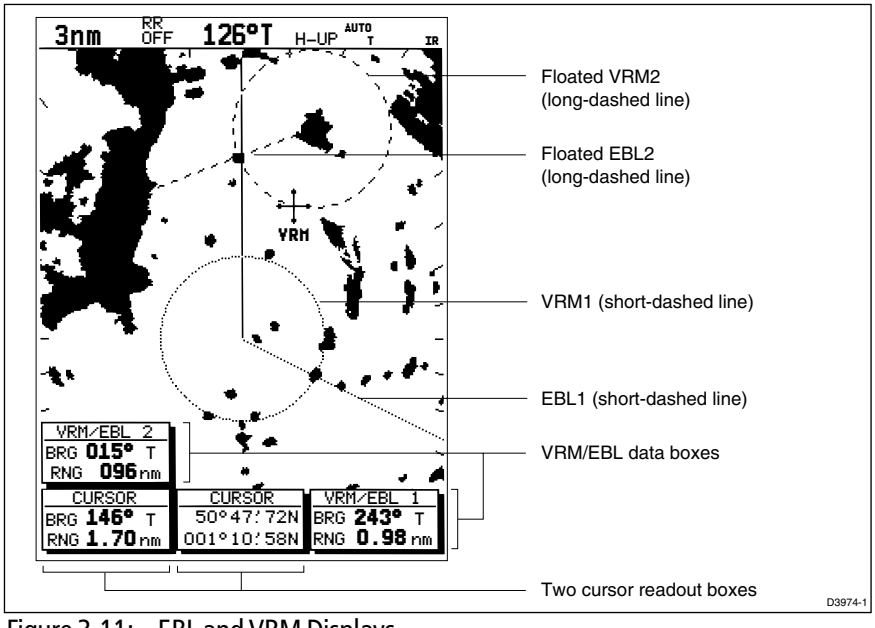


Figure 3-11: EBL and VRM Displays

Note: *When using VRM/EBLs, you may wish to turn off the range rings to make the VRMs clearer (see Section 2.4).*

VRMs move if you change the range scale, so that the actual range you have marked is maintained. VRM/EBLs also move if you offset the centre.

When a VRM/EBL pair is active, its bearing and range are displayed in its associated data box, which can be moved, deleted or reinstated.

The bearing information is displayed as either the bearing relative to your vessel's heading or (if heading data is available from a position fixer or compass) the actual bearing in degrees magnetic or degrees true. These are controlled by the setup parameters (see *Section 5.4*).

The VRM/EBL functions allow you to perform the following tasks:

- Measure the range of a target or point from your vessel's position, using a VRM
- Measure the bearing of a target or point from your vessel's position, using an EBL
- Measure the range and bearing between any two points on the radar, using the FLOAT function

Note: *An alternative method of measuring range and bearing is to use the cursor data box: If the cursor readout is set to display range and bearing (rather than Lat/Long), you can determine the range and bearing by moving the cursor over the target and checking the cursor data box readings. You can also estimate the range to a target by reference to the range rings.*

Measuring Range and Bearing to Target from Vessel

To measure the range and/or bearing of a target or point from your vessel's position, you need to place a VRM/EBL and move it so that it crosses the target or point for which you require the bearing or range.

When you turn on a VRM/EBL, it is displayed in its last-used position.

Note: *If the VRM's last-used position is outside the radar picture at the current range setting, it is placed at its default position instead. This is one third of the range for VRM1, and two-thirds for VRM2.*

Placing a VRM/EBL

Placing and positioning VRM/EBLs on the Pathfinder Plus Radar display is quick and easy.

- If a VRM/EBL is not already displayed, you can place one with a single press of the **VRM/EBL** key.
- If you have already placed a VRM/EBL, pressing the **VRM/EBL** key provides soft key control of additional functions.

➤ To place a VRM/EBL when one is not already displayed:

1. Press **VRM/EBL**.

   The radar picture shows VRM/EBL1, together with its associated data box in its last-used position.

   As shown in *Figure 3-12*, the cursor is positioned over the intersection of the VRM circle and the EBL line. It has control of the VRM/EBL as indicated by the four-way arrow, the solid VRM/EBL line, and the text VRM/EBL.

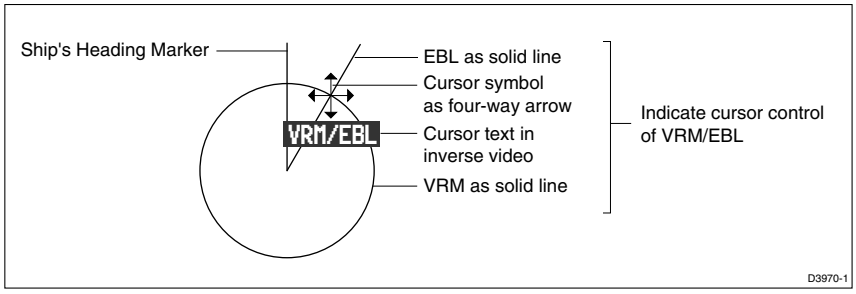


Figure 3-12: Placing a VRM

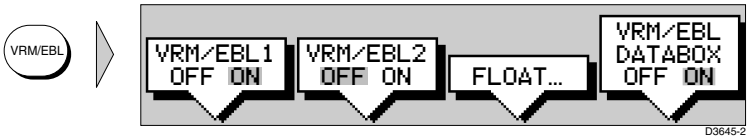
2. If required, use the trackpad controls to change the radius (range) of the VRM circle and the angle of the EBL until they cross the required target.

   The range and bearing information in the VRM/EBL data box is updated as you move the cursor.

3. Press **ENTER** to drop the VRM/EBL. The radar shows this VRM/EBL as a short-dashed line, and the cursor returns to normal control.
4. Read the range and bearing to the target or point, which is shown in the VRM/EBL data box.
5. If required, you can move or delete the VRM/EBL data box using the context-sensitive cursor.

➤ To place a VRM/EBL when one is already displayed:

1. Press **VRM/EBL** to display the VRM/EBL soft keys.



The labels for the two left-hand soft keys indicate the current status of the two VRM/EBLs.

2. Press the soft key for the VRM/EBL you require, to toggle the setting from OFF to ON.

   The soft key labels are cleared, and the radar picture shows the VRM/EBL and its associated data box.

3. Position the EBL/VRM using the trackpad, and press **ENTER** to drop it. The radar shows the VRM/EBL as a short-dashed line (VRM/EBL1) or a long-dashed line (VRM/EBL2), and the cursor returns to normal control.

Moving an Existing VRM/EBL

You can move an existing VRM/EBL using the context-sensitive cursor. You can control the VRM and EBL separately or both together.

➤ Use the context sensitive cursor to select and move any VRM and/or EBL. If you wish to change the VRM and EBL together, move the cursor over the intersection of VRM/EBL. The label indicates the current object as VRM, EBL, or VRM/EBL. See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.

Deleting an Existing VRM/EBL

➤ You can delete a VRM/EBL by using the **VRM/EBL** key to display the soft keys, and pressing the required VRM /EBL soft key to toggle the setting from ON to OFF.

➤ Alternatively, you can delete an existing VRM/EBL using the context-sensitive cursor as described in *Moving and deleting items with the context-sensitive cursor* on *page 1-10*

This has the same effect as turning the VRM/EBL off using the VRM/EBL soft keys. It turns off the VRM/EBL pair, irrespective of the cursor text: you cannot turn off VRMs and EBLs independently.

Measuring Range and Bearing Between Targets (FLOAT)

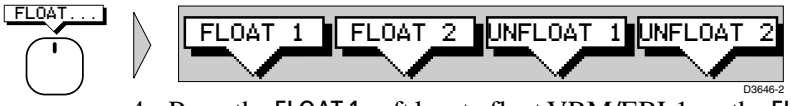
You can measure the range and bearing between any two points on the radar, such as two targets, using the Pathfinder Plus Radar's Float function. This allows you to move the origin of a VRM/EBL away from your vessel's position and onto a target. You can then change the angle of the EBL, relative to its new origin, to obtain the bearing between two points. The radius of the VRM can also be adjusted to determine the distance between two points.

Floating a VRM/EBL

Note: *You can float a VRM/EBL pair using either the soft keys or the context-sensitive cursor. The procedure for using the cursor is the same as for moving or unfloating a VRM/EBL pair, as described below; however, as it is more difficult to locate the VRM/EBL origin when it is over the center, you will probably find it easier to use the keys in this case.*

➤ To float a VRM/EBL pair using the keys:

1. If one is not already present, place a VRM/EBL pair as described in the previous section.
2. Press **VRM/EBL** to display the VRM/EBL soft keys.
3. Press the FLOAT soft key. The soft keys are updated, with the relevant options displayed.



4. Press the FLOAT 1 soft key to float VRM/EBL1, or the FLOAT 2 soft key to float VRM/EBL2.

   The soft keys are cleared. The cursor is positioned over the origin of the VRM/EBL, over your vessel. The cursor has control of the VRM/EBL, as indicated by the four-headed arrow, the text FLT in inverse video, and the solid VRM/EBL line.

5. Use the trackpad to move the origin of the VRM/EBL to the required position (over the first target).
6. Press **ENTER** to drop the VRM/EBL in its new position, or **CLEAR** to abandon the operation and return the VRM/EBL to its previous position.

   The radar shows the VRM/EBL as a short-dashed line (VRM/EBL1) or a long-dashed line (VRM/EBL2), and the cursor returns to normal control.

7. Use the context-sensitive cursor to take control of the VRM and/or EBL, to obtain the range and/or bearing to a second target, as previously described.
8. Read the range and bearing information from the VRM/EBL data box.

Moving and Unfloating a Floating EBL

You can move or unfloat a VRM/EBL that has been floated. You can unfloat a VRM/EBL either by using the context-sensitive cursor or by using the FLOAT soft key options.

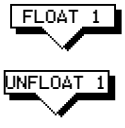
➤ To move or unfloat a floating VRM/EBL using the cursor:

1. Move the cursor over the origin of the VRM/EBL you wish to control, until the letters FLT are displayed.
2. If you wish to unfloat the VRM/EBL, press **CLEAR**. The origin of the VRM/EBL is reset to your vessel's position.
3. Alternatively, if you wish to move the floating VRM/EBL, press **ENTER** to take control of it and move it using the trackpad.

   Press **ENTER** again to drop the VRM/EBL in its new position, or **CLEAR** to abandon the operation and return the VRM/EBL to its previous position.

➤ To unfloat a floating VRM/EBL using the keys:

1. Press **VRM/EBL** to display the VRM/EBL soft keys.
2. Press the FLOAT soft key.



3. Press the UNF LOAT 1 soft key to unfloat VRM/EBL1, or the UNFLOAT 2 soft key to unfloat VRM/EBL2.

   The soft keys are cleared, and the VRM/EBL is repositioned with its origin at your vessel's position.

Controlling VRM/EBL Data Boxes

Each VRM/EBL data box is switched on and off with its associated VRM/EBL. However, when one or both VRM/EBLs are active, you can move the data box(es) and you can switch the data box(es) off at any time.

➤ You use the context sensitive cursor to select and move a VRM/EBL data box (the label BOX appears under the cursor). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.

➤ To control the VRM/EBL data boxes:

1. Press **VRM/EBL** to display the **VRM/EBL** soft keys.

2. Press the VRM/EBL DATABOX soft key to toggle the setting from OFF to ON or from ON to OFF.

Note: *VRM/EBL data boxes are not affected by the setting of the* DATABOXES *soft key accessed using the* SCREEN *default soft key. This only controls the set of data boxes available for integrated systems (see Chapter 2).*

3.5 Setting Guard Zones and Alarms

The Pathfinder Plus Radar display allows you to set up one or two guard zones, using the **ALARMS** key. You can set up sector zones or 360° (circular) zones as shown in *Figure 3-13*.

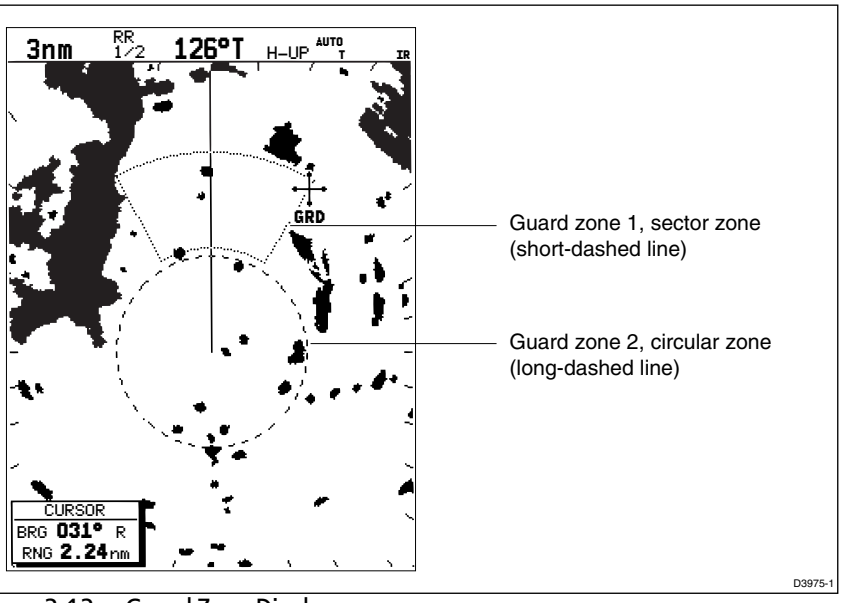


Figure 3-13: Guard Zone Display

Guard zones are fixed with respect to the ship's heading marker (SHM), moving as the SHM moves. They also move if you offset the center, or if you change the range scale, so that the area you have marked is maintained.

The guard alarm sounds when a target enters a guard zone, exceeding the target density threshold within the zone; the alarm also sounds on a repeater display. The alarm sensitivity control allows you to set the threshold above which a new target will trigger an alarm, and also to turn the alarm on or off.

Note: *A guard zone only operates when the whole zone is displayed on the screen, or could be displayed by offsetting the center. In addition, a guard zone is inactive for 10 seconds after it is placed or re-sized, to avoid inappropriate alarms during positioning.*

This section covers the following topics:

- Placing a guard zone
- Moving, reshaping or deleting a guard zone
- Controlling guard zone alarms

Placing a Guard Zone

Placing and positioning guard zones on the Pathfinder Plus Radar display is quick and easy.

- If a guard zone is not already displayed, you can place one using the **ALARMS** key.
- If you have already placed a guard zone, pressing the **ALARMS** key allows you to toggle either guard zone on or off.

Note: *When you turn on a guard zone, it is normally displayed in its last-used position and shape. However, if this position is off-screen at the current range setting, or within one quarter of the current range from your vessel, the guard zone is placed at its default position and shape instead. This is at one third (Zone 1) or two thirds (Zone 2) of the current range, as a sector zone occupying 30° either side of the ship's heading marker.*

➤ To place a guard zone:

1. Press **ALARMS**. The soft keys are displayed.

The soft keys indicate the current status of the two guard zones.

2. If necessary, press the soft key for the guard zone you require, to toggle the setting between OFF and ON. The soft keys are cleared. If you turned a guard zone on, it is displayed in its last-used position with one corner under cursor control.

   The radar picture shows the guard zone as a four-sided shape bounded by a solid line (or a circle if previously set as one).

   The cursor is positioned over an outer corner of the zone as shown in *Figure 3-14*. The cursor has control of this corner, as shown by the text GRD in inverse video, the four-headed arrow, and the solid guard zone boundary.

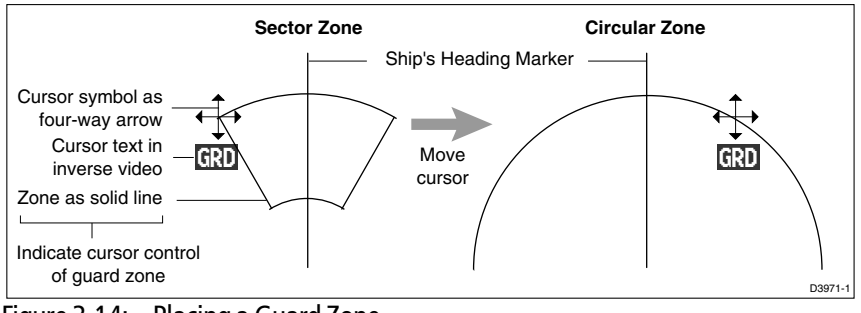


Figure 3-14: Placing a Guard Zone

3. If necessary, use the trackpad to move the corner of the guard zone to the required position. As you move the corner, the width and/or height of the zone changes, but its general sector shape is retained.

Note: *To create a 360° guard zone, rather than a sector guard zone, you can either move the corner all the way round to form a circle, or move it back to just the other side of the other outer corner.*

4. Press **ENTER** to drop the corner in its new position and redraw the zone, or **CLEAR** to abandon the operation and return the corner to its previous position.

   The display shows this zone boundary as a short-dashed line (zone 1) or a long dashed line (zone 2), and the cursor returns to normal control.

5. If required, use the context-sensitive cursor to reposition other corners/ sides of the zone in turn, as described below.

Moving, Reshaping or Deleting a Guard Zone

You can move, reshape or delete an existing guard zone using the context-sensitive cursor.

➤ You use the context sensitive cursor to reshape a guard zone by placing the cursor over thecorner or side that you wish to control (the label GRD appears under the cursor). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.

Note: *To convert a 360° guard zone back to a sector guard zone, take control of any point on the circle, and move it to open up the circle.*

➤ You can use the context sensitive cursor to delete a guard zone.

➤ You can also delete (turn off) a zone by pressing the **ALARMS** key, and then pressing the appropriate guard zone soft key to toggle the setting from ON to OFF.

Controlling Guard Zone Alarms

The guard alarm is triggered when a target enters a guard zone which exceeds the target density threshold. You can set the threshold above which a new target will trigger an alarm, and can also turn the alarm on or off.

When the alarm is triggered, the unit beeps and a text message is displayed.

➤ To clear the alarm, press **any** key (on the master or repeater display).

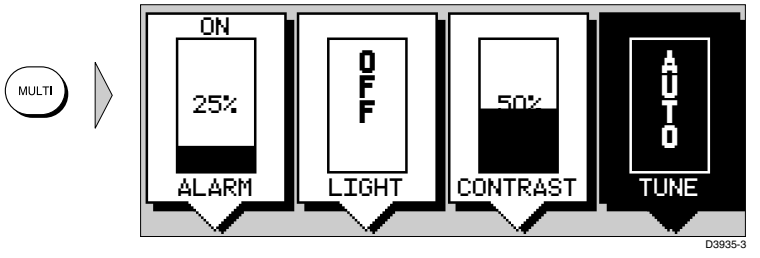
The alarm will sound again after 10 seconds, unless one or more of the following happens:

- You turn the guard zone off
- You adjust the guard zone size/shape to reduce the number of targets in the zone
- You turn the alarm off
- You decrease the alarm sensitivity
- The target leaves the guard zone

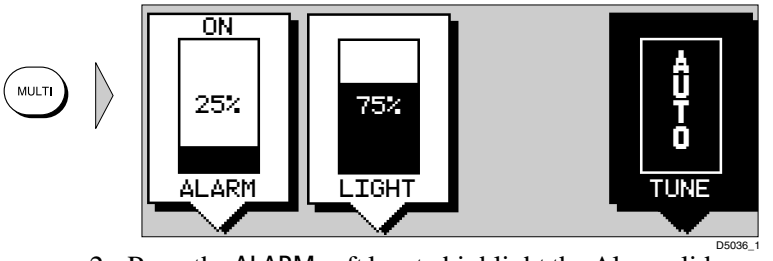
➤ To change the alarm sensitivity setting:

1. Press **MULTI** to display the sliders.

SL70M



SL70C



2. Press the ALARM soft key to highlight the Alarm slider.
3. If required, press the soft key again to toggle the setting between OFF and ON. You can only move the slider if the control is set to ON.
4. Use the trackpad to increase or decrease the alarm slider setting. You can press and hold the trackpad to change the value more rapidly.
5. The higher the setting, the more sensitive the alarm, and the smaller the target density required to set it off.
6. Press **ENTER** to clear the slider display.

3.6 MARPA

Introduction to MARPA

The SL70 series displays include a MARPA (Mini Automatic Radar Plotting Aid) function for target tracking and risk analysis. This section gives an introduction to the Pathfinder Plus Radar MARPA system and shows you how to use the MARPA functions, you should also read *Section 5.5*.

MARPA improves the standard of collision avoidance by obtaining detailed information for several automatically tracked targets. MARPA provides continuous, accurate and rapid situation evaluation.

You can acquire up to ten targets, which are then automatically tracked by the MARPA system. MARPA calculates target bearing and range, true speed and course, CPA (Closest Point of Approach), and TCPA (Time to Closest Point of Approach).

Each tracked target can be displayed with a vector depicting approximate target speed (vector length) and course (vector direction). The calculated target data can also be shown on the screen. Each target is continually assessed and you are warned if one becomes dangerous or is lost.

Effective MARPA operation is dependent on accurate own ship's heading, plus SOG and COG. The better the quality of the heading data, the better MARPA will perform. (MARPA functions without SOG and COG data but only relative vector, CPA and TCPA are shown; target course and speed cannot be calculated). For more information on heading sensors, and how to connect them to your display, refer to *Heading and Position Data* on *page 1-5* and *Appendix C*.

SAFETY NOTICES

MARPA can improve collision avoidance when used wisely. It is the user's responsibility to exercise common prudence and navigational judgements.

There are conditions where acquiring a target may become difficult. These same conditions may be a factor in successfully tracking a target. Some of the conditions are:

- The target echo is weak.
- The target is very close to land, buoys or other large targets.
- The target or your own ship is making rapid manoeuvres.
- Choppy sea state conditions exist and the target is buried in excessive sea clutter or in deep swells.

- Choppy sea state conditions exist yielding poor stability; own ship's heading data is very unstable.
- Inadequate heading data

Symptoms of such conditions are that acquisition is difficult and the MARPA vectors are unstable; the symbol wanders away from the target, locks onto another target or changes to a lost target symbol. If any of these conditions are present, acquisition and tracking may need to be re-initiated or, in some cases be impossible to maintain. Improving the quality of the heading data will reduce the effect of the other conditions.

Risk Assessment

Each target is monitored to see if it will be within a certain distance from your own vessel within a certain time. If so, the target is designated as dangerous and you are warned with an audible alarm in addition to a warning on the screen. The target symbol changes and flashes to indicate that it is a dangerous target. Pressing any key silences the alarm and removes the warning, but the target symbol remains dangerous.

Both the distance (Own Vessel Safe Zone) and the time (Time to Safe Zone) are selectable as described in *Section 5.5*.

If a target is lost, either because the MARPA software has lost contact with it, or because it has moved out of range, you are warned, again with an audible alarm and an on-screen warning. Pressing any key silences the alarm, removes the warning and removes the lost target symbol from the screen.

Target Data

All MARPA targets are stored in a MARPA database list, which shows bearing, range, course and speed of each tracked target.

For any one target a pop-up data box can be placed on the screen, this shows bearing, range, course, speed, CPA (Closest Point of Approach) and TCPA (Time to Closest Point of Approach). The target for which data is displayed is indicated by a circle around its symbol.

Each target is displayed as a symbol to indicate its status:

Target is being acquired

Target is safe

Target is dangerous.

Target is Lost

The dangerous and lost symbols are shown flashing.

Target Vector and History

The MARPA targets can be displayed with a vector line showing where they will be at a certain time in the future, (assuming present course and speed). You can select a relative or true vector and the vector length. The vector type (RV or TV) and length are shown in the status bar.

You can also select to view the target's history, this appears as a series of dots that are dropped by the target as it makes way. The interval between them is selectable.

A **relative vector** indicates the target's motion related to your own ship's motion. The target's relative course and speed are calculated to produce a vector that is displayed on the target only. This mode is used for collision avoidance and threat assessment.

A **true vector** indicates the target's motion over ground. In this mode true vectors for the target and your own ship are displayed. MARPA measures the direction in which the target and own ship are actually moving over the ground. The result is the vessel's *true course*, the rate of motion is the vessel's *true speed.* Consider this motion as if you were in a helicopter looking down watching the targets move across the water. This mode can aid navigation.

Section 5.5 describes how to set the target vector and history parameters.

Data Transfer

MARPA data is sent on NMEA allowing any other equipment, with the necessary functionality, to show the tracked targets' data.

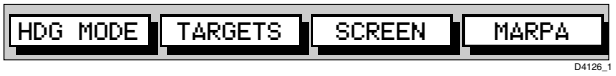
Radar Range Scales

MARPA target acquisition is only available at radar range scales of up to 12nm, although tracking continues at all ranges.

Note: *If you change to a lower range scale, targets may be beyond the range of the scanner and will be lost. In such cases an alarm pop-up indicates the target is off-screen.*

Using MARPA

The MARPA functions are accessed through the MARPA default soft key, and some options are available with the context sensitive cursor, or through the MARPA database list. Where there are two ways of performing a certain function this section describes both ways. Information on how to set up the MARPA system is in *Section 5.5*.



Acquire a Target

➤ To acquire a target:

1. Press the MARPA soft key to display the ACQUIRE TARGET soft keys.

2. Position the cursor over the required target and press the ACQUIRE TARGET soft key.

   The ⬚ symbol is placed at the cursor position and the radar searches for a target at the cursor position. If a target is present for several scans the radar locks onto it and the symbol ◯ indicates a safe target, the target vector is also displayed. If the target is continuously lost, the lost target symbol ⟠ is displayed and a Lost Target alarm is generated; press any key to cancel the alarm and remove the lost target symbol from the display.

3. Press **ENTER** or **CLEAR** to return to the default display.

Cancel a Target

➤ To cancel a target using the context-sensitive cursor:

1. Move the cursor over the target, the following soft keys are displayed.

2. Press the CANCEL TARGET soft key to cancel target tracking and remove the symbol from the display. The default soft keys are displayed.

➤ To cancel a target from the database list.

1. Press the default soft key MARPA to display the MARPA soft keys.
2. Press the MARPA LIST soft key, the database list is displayed.

3. Use the trackpad to select a target, then press the CANCEL TARGET soft key to remove the selected target.
4. Press **CLEAR** to remove the database list.

View Target Data

You can toggle the MARPA data box on/off using the MARPA BOX ON/OFF soft key. This box displays the data for one MARPA target. You can select the target using the context sensitive cursor or the database list. Alternatively, if you display the data box when no target is selected, data is displayed for the last target that had the data box displayed – unless a new target has been acquired, then the new target data is displayed.

➤ To view (or hide) target data using the cursor:

1. Move the cursor over the target for which you require data. The letters MARPA and the following soft keys are displayed.

2. Press the MARPA BOX ON/OFF soft key to toggle the data box on/off for the selected target.The target data box is displayed and the associated target symbol is identified by a circle drawn around it.
   The default soft keys are displayed when you move the cursor away from the target.

Note: *When you select* ON*, if the data box was already displayed for another target, it is updated for the selected target.*

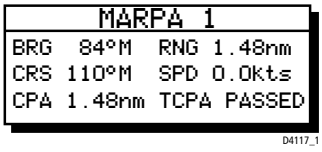


Figure 3-15: MARPA Target Data Box

➤ To view (or hide) target data using the default soft keys:

1. Press MARPA to display the MARPA soft keys.

2. Press the MARPA BOX ON/OFF soft key to toggle the data box on. The target data box is displayed and the associated target symbol is identified by a circle drawn around it. The default soft keys are displayed.
3. Press the MARPA BOX ON/OFF soft key again to toggle the data box off.

➤ To view the MARPA database list and a target data box:

1. Press MARPA followed by the MARPA LIST soft key, the database list is displayed.

2. Use the trackpad to select a target, then press the MARPA BOX ON/OFF soft key to toggle the data box on/off.
3. Press **CLEAR** to remove the database list.

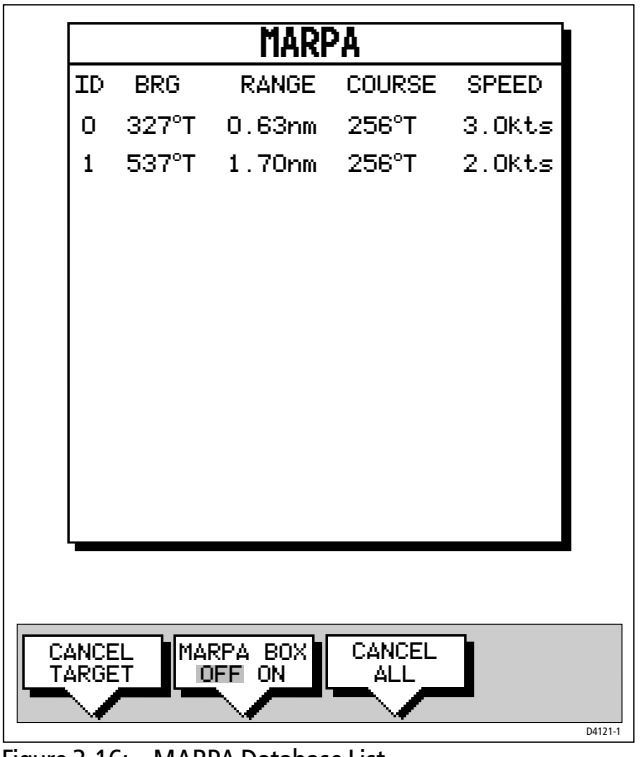


Figure 3-16: MARPA Database List

➤ To cancel *all* targets:

1. Press MARPA followed by MARPA LIST to display the database list.

Press the CANCEL ALL soft key. You are prompted to confirm.

Press YES to continue, all the MARPA targets are cleared from the screen, and the data is removed from the MARPA database list.
Press NO to cancel the operation.

Chapter 4: Integrated Radar Operations

4.1 Introduction

This chapter explains how to use and display non-radar information that may be available from other units connected to your system. It also explains how to use the man overboard (MOB) function.

You can use this chapter with the radar display set to *simulator mode,* or on the water after you have installed and set up your Pathfinder Radar system.

In order to use these functions, you need the following additional data from equipment connected to your system via a SeaTalk or NMEA link:

Table 4-1: Function of External Data

Data	Example source	Integrated functions available
Heading	Compass* Autopilot	- Heading value in status bar - North Up or Course Up heading modes (as alternatives to Head Up - MOB (if speed data also available)
*If heading data is available via both NMEA and SeaTalk, NMEA data takes priority. For all other data, SeaTalk data takes priority (see *Section 6.8*).		
Waypoint data	Chartplotter	- Waypoint display and data
Position	GPS system	- Marks - Position data in Data Box and Nav Window - MOB - COG, SOG and time
Other data	Transducers	- Data Box and Nav Window data displays including speed, depth, wind

This chapter covers the following topics:

- Changing the heading mode of the radar picture
- Using marks
- Man Overboard (MOB)
- Cursor echo

Note: *Until you are familiar with interpreting the radar display, you should take every opportunity to compare the radar's display patterns with visual targets, such as other vessels, buoys and coastal structures. You should practice harbour and coastal navigation during daylight and in clear weather conditions.*

4.2 Changing the Heading Mode

The radar picture is normally shown with your vessel's dead ahead bearing straight up, as indicated by the Ship's Heading Marker at 0° relative bearing. This is the Head Up orientation.

If heading information is available via a SeaTalk or NMEA connection, you can choose a different heading mode. In Course Up and North Up mode you can also select relative or true motion.

True and Relative Motion

Relative motion is the default for the radar display. In relative motion your own ship's position remains fixed on the radar screen and all radar targets move relative to your own ship.

In true motion, fixed radar targets maintain a constant position on the screen, whilst your own ship moves across the radar image at the appropriate speed and heading. A map-like image is thus displayed, with all moving vessels travelling in true perspective to each other and to fixed land masses.
As your ship's position approaches the edge of the screen, the radar display is automatically reset to reveal the area ahead of your ship. You can manually reset your ship's position at any time by pressing the TRUE REL soft key twice.

Heading Modes

The heading modes are as follows:

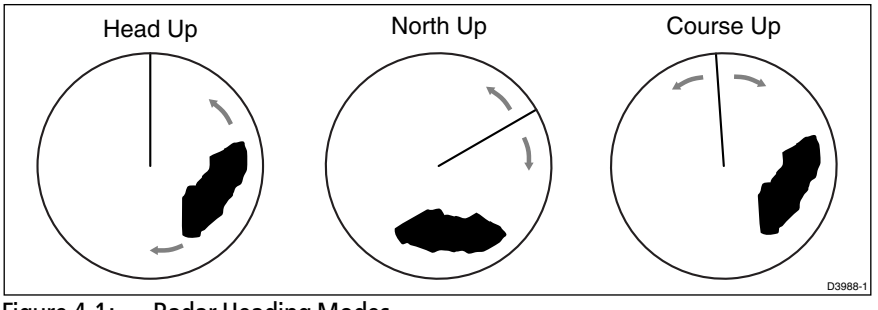


Figure 4-1: Radar Heading Modes

- **Head Up:** The radar picture is displayed with the vessel's current heading upwards. As the heading changes the picture will rotate.
- **North Up:** The radar picture is stabilized and displayed with north upwards. As you change heading, the ship's heading marker moves.
- **Course Up:** The radar picture is stabilized and displayed with the currently selected course upwards. As you change heading, the ship's heading marker moves. If you select a new course, the picture resets to display the new course upwards.

The reference used for the Course Up depends on the information available. The first available in the following list is used:

1. A locked heading (i.e. the heading being used by an autopilot) over a SeaTalk connection
2. The heading at the time Course Up was selected

If 1. is in use and a new course (locked heading) is selected, the picture automatically rotates to the new Course Up.
If 2. is in use, press the HDG MODE soft key then COURSE UP to manually reset the Course Up to the new course.

Selecting the Heading and Motion Mode

Press the HDG MODE default soft key to obtain the following display, when heading information is available:

The currently selected mode is highlighted, and is indicated in the radar status bar (N-UP, C-UP or H-UP and TM or RM).

➤ To change the heading and motion mode:

1. Press the HDG MODE default soft key.
2. Press the soft key corresponding to the mode you require. The radar picture changes to the selected mode.
3. Press **ENTER** to clear the heading mode soft keys. The current orientation is indicated in the status bar.

Note: *True Motion is only available in Course Up and North up mode.*

If you re-select Course Up when this is already the current mode, the Course Up reference is reassessed according to the current data.

Effect on VRM/EBLs

VRM/EBLs do not move on the screen, unless you change the range, offset the centre, or change the heading mode.

- In Head Up mode, the VRM/EBLs are fixed with respect to the ship's heading marker.
- In North Up mode, the VRM/EBLs are fixed with respect to North.
- In Course Up mode, the VRM/EBLs are fixed with respect to the selected course.

4.3 Using Marks

The Marks function allows you to place a mark anywhere on the radar picture. You can also move existing marks or delete them. You should be aware that radar marks are not the same as chart waypoints and cannot be used in routes, nor can they be transferred to other displays.

Marks are placed with the default mark symbol ⊗ at either cursor or vessel position. If you wish to use a different symbol, you can change the default setting from the RADAR SET UP menu (see *Section 5.4*). Mark symbols are always displayed within a circle.

Marks are stored with their latitude, longitude and symbol; the information is retained when the radar is turned off. Up to 100 marks can be stored in each display unit.

Note: *When you use the* **MARKS** *key to access the Marks function, simply press the key momentarily and release it. If you hold it down for two seconds, the Pathfinder Radar will enter man overboard (MOB) mode, as described in Section 4.4.*

The Marks function is only available when your vessel's position is known via the SeaTalk or NMEA connection.

Placing a Mark

➤ To place a mark symbol:

1. Press the **MARKS** key. The soft keys PLACE MRK AT CURSOR and PLACE MRK AT VESSEL are displayed.
2. To place a mark at the cursor, position the cursor at the required point. If you are displaying the cursor position box showing the lat/long position, you can check the coordinates to place the mark accurately.
   Press the PLACE MARK AT CURSOR softkey.The mark is placed using the default symbol.

3. To place a mark at the vessel position, press PLACE MRK AT VESSEL. The mark is placed using the default symbol.

Note: *If the Mark database is full, a warning message is displayed, with the position (in latitude and longitude) of the oldest mark. You have the following options:*

i. Press the YES soft key to replace this old mark with the new mark.

ii. Press the NO soft key to keep the old mark and display the next oldest mark. You can keep pressing NO to step through the mark database until a mark you wish to replace is displayed, and then press YES.

iii. Press **CLEAR** to keep all the existing marks, and cancel the new mark placement.

Moving or Deleting a Mark

You can move or delete marks using the context-sensitive cursor.

➤ Use the context sensitive cursor to move or delete a mark (the label MRK appears under the cursor). See *Moving and deleting items with the context-sensitive cursor* on *page 1-10*.

4.4 Man Overboard (MOB)

If you lose a person or object overboard, and need to return to the location, you should use the Man Overboard (MOB) function immediately.

Note: *To obtain an MOB position, you need either of the following:*

- Position data from a GPS or equivalent device
- Heading and speed data, so that the position can be calculated by dead reckoning

You can select the type of data used for the MOB position using the Set Up Menus (see *Section 5.3*).

➤ To initiate the MOB procedure, press and hold the **MARKS** key for two seconds.
The Pathfinder Plus Radar then performs all the following tasks automatically:

- Marks the current position with a MOB symbol.
- The MOB waypoint replaces any current active waypoint and route.
- Displays the MOB data box, showing the bearing and distance from your vessel to the MOB waypoint position, and the elapsed time since the MOB was initiated.
- Displays the position data box, showing your vessel's position.
- As your vessel moves away from the MOB position, a dotted line is displayed connecting the MOB position and the vessel's current position.
- Sounds a 4-second alarm pattern every 30 seconds.
- Sends an MOB message to other units in the system, via the SeaTalk connection.

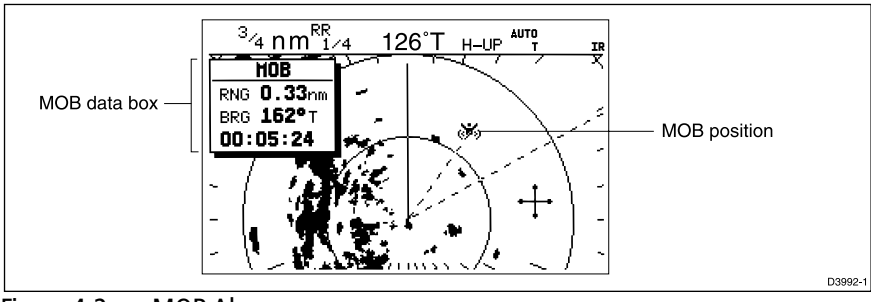


Figure 4-2: MOB Alarm

MARKS

➤ To cancel the MOB, press and hold the **MARK** key for 2 seconds.

Note: *The MOB procedure can also be initiated or cancelled remotely if the appropriate SeaTalk message is received by the Pathfinder Radar.*

4.5 Cursor Echo

In a system with any chart display connected via Seatalk, you can set the display to enable cursor transfer. Cursor echo (accessed from the Set Up Menu) enables you to display a chart cursor on the radar picture, or a radar cursor on the chart picture (you cannot display a remote radar cursor in a radar window, nor a remote chart cursor in a chart window).

The following options are provided:

- **Radar Cursor In :** - not valid for SL70C and SL70M displays.
- **Chart Cursor In:** displays the cursor from another chartplotter on the radar window (default - OFF).

Note: *The remote display must have SeaTalk Cursor Out enabled.*

- **SeaTalk Cursor Out:** enables the output, onto SeaTalk, of the display's own cursor (default - OFF).
- **Cursor Echo Local:** - not valid for SL70C and SL70M displays.

When the appropriate option is switched on, the display shows its own cursor, plus the cursor of the other display(s) with appropriate cursor text (RDR or CHT) to indicate its origin. This means that you could move the cursor over a target on the radar display, and check the identity of the target by looking at the radar cursor position on the chartplotter.

Refer to *Section 5.3* for cursor echo set up details.

Chapter 5: Setting Up the System Defaults

5.1 Introduction

Once you have installed your display unit and are familiar with its basic operation (described in *Chapter 1* and *Chapter 2*), you need to set it up so that it obtains the correct information from the equipment you have connected it to, operates according to your requirements, and displays information according to your preferences.

This is achieved using the soft key controls that are displayed when you press the **MENU** key.

In most cases, you will only need to use the **MENU** key options when you first set up your system. However, you may decide to change the way you have customized some aspects, such as the screen and help setting, as you become more familiar with your system.

Once you have set the values, they remain as the default settings until you reset them; they are retained even if you power off your display.

This chapter covers the following topics:

- Changing the default set up parameters
- System parameter functions and default settings
- Radar-specific parameter functions and default settings
- MARPA specific parameters and default settings
- Advanced Radar functions

You should check the functions of the parameters, and decide on the new settings, before making the changes.

5.2 Changing the Set Up Parameters

The set up parameters are divided into four sections:

- **System**, to control the aspects of the system that are not specific to the radar or chart.
- **Radar**, includes bearing alignment, display preferences and the timed transmission option.
- **MARPA**, to control the MARPA target tracking parameters, including target vectors, safe zone and target history display.
- **Advanced**, to control specialist radar settings such as display timing, STC preset and tune preset (see *Section 5.6* for instructions on how to access these functions).

Note: *The GPS and Track Set Up menus are described in Chapter 4.*

This section provides instructions for displaying and changing the default values. The following sections list the parameters and their possible settings, and describe the function of each parameter in turn.

➤ To set the default parameters:

1. Press the **MENU** key to display the set up soft keys - the options available depend on the selected operating mode.

2. Press the soft key for the set up you require.

   The requested set up menu is displayed, listing the parameters and their current settings.

3. Use the trackpad to move the selection bar up and down the list. An arrow is displayed at the top or bottom right-hand corner if you can scroll the list to display further parameters.

   As each line is highlighted, the soft keys are updated to show the settings available.

   - For parameters that have a numeric value, or more than four possible settings, a scroll list is displayed above two of the soft keys.
   - Some parameters are controlled by a slider that is displayed above two of the soft keys.
   - For some parameters, a soft key provides access to a sub-menu of further options.

4. Press the soft key corresponding to the desired setting or, for scroll lists, use the soft keys to scroll forwards or backwards through the list until the

required setting is displayed. This setting is retained when you move the selection bar on to the next parameter in the menu list.

For sliders, press the appropriate soft key repeatedly to increase or decrease the slider value in individual steps, or press and hold the key to change the setting quickly.

5. Once you have set all the required values, press **ENTER** to clear the menu and return to the set up soft keys.
6. Press **ENTER, MENU** or **CLEAR** to clear the soft keys and return to the default display.

You can return all the settings to their original factory settings, if required, by performing a factory reset as described in *Chapter 7*.

5.3 System Set Up Parameters

The following table lists the System menus and their options, shows the factory default setting, and provides a space for you to make a note of your new default setting. Each parameter is described in the following subsections.

Table 5-1: System Set Up Parameters

Menu	Options	Factory Default	New Default
DATA BOXES			
POSITION	OFF, LAT/LONG, TDs	OFF	
SPEED	OFF or ON	OFF	
DEPTH	OFF or ON	OFF	
COG	OFF or ON	OFF	
SOG	OFF or ON	OFF	
TIME	OFF or ON	OFF	
DATE	OFF or ON	OFF	
WIND	OFF, APP, TRUE or BOTH	OFF	
WAYPOINT	OFF, LAT/LON, or RNG/BRG/TTG	OFF	
CROSS TRACK ERROR	OFF or ON	OFF	
HEADING	OFF or ON	OFF	
LOG/TRIP	OFF or ON	OFF	
PILOT	OFF or ON	OFF	
VMG	OFF, WIND, WPT or BOTH	OFF	
TEMPERATURE	OFF or ON	OFF	
TIDE SET/DRIFT	OFF or ON	OFF	
BEARING MODE	MAGNETIC, TRUE	TRUE	
CURSOR REFERENCE	MAG/TRUE, RELATIVE	RELATIVE	
CURSOR READOUT	OFF,LAT/LONG,RNG/BRG,BOTH	RNG/BRG	
DAY/NIGHT	DAY, NIGHT	DAY	
HELP	OFF/ON	ON	
SOFT KEYS	OFF/ON	ON	
KEY BEEP	OFF/ON	ON	
MOB DATA	DR, POSITION	DR	
PILOT POP-UP	OFF/ON	OFF	
MENU TIMEOUT PERIOD	NO TIMEOUT, 10, 20, 30 SECONDS	NO TIMEOUT	
DISTANCE UNITS	NAUTICAL MILES, STATUTE MILES, KILOMETERS, KILOYARDS	NAUTICAL MILES	
SPEED UNITS	KNOTS, MILES PER HOUR, KILOMETERS PER HOUR	KNOTS	
DEPTH UNITS	METERS, FEET, FATHOMS	FEET	
TEMPERATURE UNITS	CENTIGRADE, FAHRENHEIT	FAHRENHEIT	

Table 5-1: System Set Up Parameters

Menu	Options	Factory Default	New Default
VARIATION SOURCE	AUTO, MANUAL	AUTO	
BRIDGE NMEA HEADING	OFF or ON	ON	
NMEA OUT SET UP			
APB	OFF or ON	ON	
BWC	OFF or ON	ON	
BWR	OFF or ON	ON	
DBT,	OFF or ON	ON	
DPT	OFF or ON	ON	
MTW	OFF or ON	ON	
RMB	OFF or ON	ON	
RSD	OFF or ON	ON	
RTE	OFF or ON	ON	
TTM	OFF or ON	ON	
VHW	OFF or ON	ON	
VLW	OFF or ON	ON	
WPL	OFF or ON	ON	
GGA	OFF or ON	ON	
GLL	OFF or ON	ON	
RMA	OFF or ON	ON	
RMC	OFF or ON	ON	
VTG	OFF or ON	ON	
ZDA	OFF or ON	ON	
CURSOR ECHO			
RADAR CURSOR IN	Not valid for SL70C and SL70M displays	OFF	
CHART CURSOR IN	OFF or ON	OFF	
S/T CURSOR OUT	OFF or ON	OFF	
CURSOR ECHO LOCAL	Not valid for SL70C and SL70M displays	ON	
DATE FORMAT	DD/MM/YY, MM/DD/YY	MM/DD/YY	
TIME FORMAT	12 HOUR, 24 HOUR	12 HOUR	
TIME OFFSET	UTC, or local offset value: Plus or minus up to 13 hours, in whole hours	UTC	
GPS SOG/COG FILTER	HIGH, MEDIUM, LOW	MEDIUM	
COMPASS SET UP		-	
LINEARISE COMPASS	Press soft key to start the linearisation procedure and		
ALIGN HEADING	to align the heading		
LANGUAGE	ENGLISH (UK), ENGLISH (US), DANISH, FRENCH, GERMAN, DUTCH, ITALIAN, ICELANDIC, NORWEGIAN, PORTUGUESE, SPANISH, SWEDISH, FINNISH	ENGLISH (US)	
SIMULATOR	OFF, DATA, RADAR, BOTH	OFF	

Data Boxes

Press the SELECT BOXES soft key to display the data box sub-menu. This allows you to select up to 6 data boxes that you can display.

Note: ***1.*** *A fixed set of 9 (mono) or 16 (color) of these data items are available for display in the Nav Data half-screen window (see Chapter 2).*
2*. In addition to these grouped data boxes, boxes for the cursor readout, VRM/EBL data, waypoint data, MOB data and simulator status are displayed when selected or when the appropriate function is active..*

Data boxes provide regularly used data in a compact form so that most of the picture can still be seen. The ones you select here can be turned on and off as a group during normal operation, and you can also move them around the screen individually using the context-sensitive cursor (see *Context-Sensitive Cursor Control* on *page 1-10.)*.

Bearing Mode

The mode (magnetic or true) of all the bearing and heading data displayed. This is indicated in the status bar after the heading value.

Cursor Reference

The mode of the bearing data displayed for the cursor readout. The bearing information can be displayed in either of two forms:

- Relative: The bearing relative to your vessel's heading.
- Mag/True: The actual bearing in either degrees magnetic or degrees true. This option is only available if you have heading data from a compass.

  If you choose this mode, the selection you made for the previous parameter (Bearing Mode), °M or °T, is displayed in the cursor (Rng/Brg) data boxes. The current units are shown for the heading value in the status bar at the top of the screen.

Cursor Readout

This option controls whether the cursor data is shown in latitude and longitude or in range and bearing. Alternatively, you can show both types of readout, in separate boxes, or turn the cursor data box off.

You can also turn the cursor readout box(es) on and off during normal operation, via the SCREEN default soft key (see *Switching the Cursor Data Box On and Off on page 2-10.)*

Day/Night

This option allows you to change the display between day and night modes. If you select NIGHT mode, a different palette, more suited to night time viewing is used.

Help

When Help is set to ON, a prompt appears when selecting a soft key or menu choice, and when using the context-sensitive cursor. The help message is cleared when an action is selected.

Soft Keys

When the Soft Keys option is set to ON, the default soft keys are displayed if no other operation is in progress.
When the Soft Keys option is set to OFF, the default soft keys are only displayed when a soft key is pressed, and they disappear if no operation is performed for 10 seconds.

Key Beep

This option controls whether or not the keys make a noise when you press them.

MOB Data

This option controls whether MOB data is based on position data, or on dead reckoning (DR). Dead reckoning normally provides a better indication of the course to an object in the water, on the assumption that your vessel and the object are both subject to the same tide and wind effects.

Autopilot Pop Up

This option controls whether or not the autopilot pop up is displayed. When set to ON, if the status and locked heading of the autopilot changes, they are displayed in a pop up box. The box is removed from the display after two seconds.
When Autopilot Pop Up is set to OFF, the pop up box is disabled.

Menu Timeout Period

With no timeout set, menus and soft key labels remain displayed until you clear them by pressing **ENTER**, **CLEAR** or the appropriate dedicated key.

If you set a value here, the menus and soft key labels will be cleared if a key has not been pressed for the specified number of seconds.

This setting does not affect the *default* soft key labels, which are controlled by the Soft Keys option (see above).

Units

You can set the units for speed, depth and temperature. The units you set will be used to display all data, including information received from other instruments on the system. However, the distance units do not affect the instrumented range of the radar, which is always in nautical miles.

Variation Source

The variation value is the difference between True and Magnetic direction data for heading or bearing values. The Variation Source option provides soft keys for selecting Auto or Manual variation mode, displays the current variation value for each and highlights the currently selected mode.

Auto Mode

If you select Auto mode, the display obtains the value of variation automatically, normally from received data. The variation value that is used depends on the data available, and is selected in the following order of priority:

1. Variation value from the same source as the heading data:
   - If heading data is being taken from NMEA, then variation is also taken from NMEA
   - If heading is taken from SeaTalk, then SeaTalk variation is used
2. Variation value from a different source:
   - If heading data is being taken from NMEA, but no NMEA variation is available, then variation is taken from SeaTalk
   - If heading is taken from SeaTalk, but no SeaTalk variation is available, then variation is taken from NMEA
3. A calculated variation value, using position data, if no SeaTalk or NMEA value is available
4. The current manual variation value, if no SeaTalk or NMEA value and no position data is available

Manual Mode

If you select Manual mode, by pressing either of the MANUAL keys, you can specify the local variation value according to the area in which you are operating. Press the appropriate MANUAL key to adjust the variation up or down, to a maximum of 30° East or West.
This value is then transmitted to any other SeaTalk instruments on your system. It is retained if you turn the display off and on again.

In Manual mode, incoming NMEA variation is ignored. However, if the variation is changed on another SeaTalk instrument, the new value is used and the manual value that is displayed is updated.

Note: *The Manual variation value defaults to 0°, so it is important to set up a value if variation is not available from an external source.*

Bridge NMEA Heading

The display bridges NMEA input data to the SeaTalk bus (see *Section 6.8*). The Bridge NMEA Heading option can be used to prevent NMEA heading data being bridged onto the SeaTalk bus.

For example, if you have a course computer connected on SeaTalk and NMEA, and an active compass connected on NMEA(for MARPA), SeaTalk data overrides NMEA data in the course computer. You should therefore switch OFF the Bridge NMEA Heading option to ensure the course computer receives the same NMEA heading input as the display system.

NMEA Out Set Up

This option lets you switch off individual NMEA out sentences.

Cursor Echo

You can set up an integrated system so that radar and chartplotter displays connected via SeaTalk can display each other's cursors.
Cursor echo functions so that you can display a chart cursor on the radar picture, or a radar cursor on the chart picture (you cannot display a remote radar cursor in a radar window nor a remote chart cursor in a chart window). When the appropriate options are switched on, each display shows its own cursor, plus the cursor of the other display with appropriate cursor text (RDR or CHT) to indicate its origin. This means that you could move the cursor over a target on the radar display, and check the identity of the target by looking at the radar cursor position on the chartplotter.

Press the CURSOR ECHO soft key to display the cursor transfer soft keys. The following options can be toggled ON or OFF:

- **Radar Cursor In:** - not valid for SL70C and SL70M displays.
- **Chart Cursor In:** displays the cursor from another chartplotter on the radar window (default - OFF).

Note: *The remote display must have SeaTalk Cursor Out enabled. Raymarine recommend that in multi-display systems, you do* ***not*** *enable Cursor Out on more than two displays. If multiple displays have cursor out enabled, the cursors will not be displayed simultaneously, but will flash on/off.*

- **SeaTalk Cursor Out:** enables the output, onto SeaTalk, of the display's own cursor (default - OFF).
- **Cursor Echo Local:** echoes the cursor position between open windows on the same display (default - ON)- not valid for the SL70C and SL70C displays.

If you set the options to OFF, no cursor echo information is displayed.

Date and Time Settings

Set your preferred date format (DD/MM/YY or MM/DD/YY) and time format (12 or 24 hour). If you wish to display local time, use the soft keys to change from UTC to the required time offset. This can be up to plus or minus 13 hours, in hourly steps.

GPS SOG/COG Filter

The SOG/COG filter averages the velocity vectors to compensate for the oscillating motion of the vessel, giving a clearer indication of the vessel's course and speed. The filter does not affect the calculation of the GPS position. The velocity vectors calculated from the GPS Signal give an instantaneous measure of speed and direction of the GPS antenna. The COG and SOG can therefore seem erratic under certain conditions. For example, when a vessel is moving slowly through rough seas, the antenna moves from side to side as well as in the direction of the vessel.

Slow moving vessels, or vessels sailing in rough seas will benefit from a high setting, whereas a power boat that can quickly change speed and direction will benefit from a low setting.

Select the SOG/COG filter setting as required. This can be set to HIGH, MEDIUM or LOW.

Compass Set Up

This option is used to calibrate a Raymarine heading sensor such as the Pathfinder Smart Heading System. Controls are provided for Linearise Compass which detects and corrects for heading errors caused by metal objects, and Align Heading which matches the displayed heading to a known heading or transit.

Refer to the Handbook supplied with your heading sensor for more details.

Language

Select the language in which you wish information to be displayed. The selected language will be used for screen text, labels, menus and options, but will not affect the letters displayed by the context-sensitive cursor. The language setting also affects the display format for lat/long position information.

Simulator

The simulator allows you to operate your display without data from the antenna and/or external data sources. The system set up simulator options have the following functions:

- **Data** provides simulated numerical data, and a waypoint display.
- **Radar** provides simulated radar picture, with example targets. The picture does not change if you change the range, although the range rings are adjusted (see *Chapter 3*).
- **Both** provides simulated data and radar picture.

When the simulator is switched on, a SIMULATOR data box is displayed during operation, showing the simulation selected.

5.4 Radar Set Up Parameters

The RADAR SET UP option allows you to set up the radar according to your system configuration and your personal preferences.

Note: *Some parameters can only be changed if you are using the Master display (that is, the display to which the scanner is connected).*

The following table lists the Radar Set Up parameters and their options, shows the factory default setting, and provides a space for you to make a note of your new default setting. Each parameter is described in the following subsections.

Table 5-2: Radar Set Up Parameters

Parameter	Options	Factory Default	New Default
EBL DISPLAY	MAG/TRUE, RELATIVE	RELATIVE	
TIMED TRANSMIT	OFF, ON	OFF	
TRANSMIT PERIOD	10 scans, 20 scans, 30 scans	20 scans	
STANDBY PERIOD	3, 5, 10 or 15 mins	10 minutes	
DEFAULT MARK SYMBOL			
MARK DISPLAY	OFF, ON	ON	
CLEAR MARKS	Press soft key to clear marks database	N/A	
CUSTOM SCALE	OFF, ON,SET RANGES...	OFF	
BEARING ALIGNMENT	Slider value	0°	
ANTENNA SIZE	4 ft., 6ft (only if an open array scanner is connected)	4 ft.	
SEND ON HSB	Not valid for SL70 PLUS Series		

EBL Display

The mode of the bearing data displayed for Electronic Bearing Lines (EBLs). The bearing information can be displayed in either of two forms:

- **Relative:** The bearing relative to your vessel's heading.
- **Mag/True:** The actual bearing in either degrees magnetic or degrees true. This option is only available if you are obtaining data from a compass.

  If you choose this mode, the selection you made for Bearing Mode determines whether °M or °T is displayed in the EBL data boxes. The current units are shown for the heading value in the status bar at the top of the screen.

Timed Transmission Option

The TIMED TRANSMIT parameter, together with the TX PERIOD and STANDBY PERIOD parameters, controls the radar's timed transmission power-saving mode.

When TIMED TRANSMIT is set to ON, the scanner performs the number of scans specified by TX PERIOD and then shuts down for the number of minutes specified by STANDBY PERIOD. While it is shut down, the scanner does not rotate, and the display is in stand-by.

Set the TIMED TX parameter to OFF for normal operation. In this case, the TX PERIOD and STANDBY PERIOD values are ignored.

Note: *Timed Transmission is not available on a Repeater Display.*

Marks Options

You can select the mark symbol that will be used when you place a mark (see *Section 4.3*).

If you turn the MARK DISPLAY option OFF, any marks you have placed are hidden on the display, but retained in the marks database. You can turn the option on again to display them at any time.
To clear all stored marks from the marks database, press the CLEAR MARKS soft key, and the YES soft key to confirm the deletion.

Custom Scale

You can set up your own range scale. When switched ON, this is used instead of the Pathfinder Plus Radar default range scale (see *Section 3.2*).

To set up a scale, press the SET RANGES soft key. The Custom Range Setup Menu is displayed, which allows you to change the maximum range for each range selection.

The following table lists the ranges, shows the factory default setting, and provides a space for you to make a note of your new setting.

Table 5-3: Radar Custom Range Scales

Range	Default Setting (nm)	New Setting (nm)
1	0.125	
2	0.25	
3	0.5	
4	0.75	
5	1.5	
6	3.0	
7	6.0	
8	12.0	
9	24.0*	
10	48.0*	
11	72.0*	

* Maximum range depends on scanner type, refer to the Scanner Owner's Handbook.

To change the range scale, highlight the required range and use the soft keys to change the value. Start at the top of the list and work down, since each value must be greater than the value for the previous range in the list. The following scale increments are available:

Table 5-4: Radar Range Scale Increments

Range Scales (nm)	Scale Increments (nm)
0.125 to 0.5	0.125
0.5 to 3.0	0.25
3.0 to 6.0	0.5
6.0 to 24.0	2.0
24 to maximum for scanner	4.0

When you have finished setting up the new scale, press **ENTER** to return to the Radar Set Up Menu, and press the ON soft key to select your new scale.

Bearing Alignment

The bearing alignment is normally set when you first install your system, and is described in *Radar System Checks and Adjustments* on *page 6-17*.

The bearing alignment corrects for display azimuth error. It can be set to a value in the range -180° to +179.5°, in increments of 0.5°.

Antenna Size

This option is used to specify the size of an open array scanner. Refer to the Pathfinder Scanner Owner's handbook for further details.

Send on HSB

This option is not valid on the SL70 PLUS series systems.

5.5 MARPA Set Up Parameters

The MARPA set up menu provides options to specify the target vectors, safe zone and target history display.
The following table lists the MARPA Set Up parameters and their options, shows the factory default setting, and provides a space for you to make a note of your new default setting. Each parameter is described in the following subsections.

Table 5-5: MARPA Set Up Parameters

Parameter	Options	Factory Default	New Default
TARGET VECTOR	TRUE RELATIVE	RELATIVE	
VECTOR LENGTH	30 SECS, 1 MIN, 3 MINS, 6 MINS, 12 MINS	3 MINS	
OWN VESSEL SAFE ZONE	0.1 nm, 0.2 nm, 0.5 nm, 1.0 nm, 2.0 nm	0.5 nm	
TIME TO SAFE ZONE	3 MINS, 6 MINS, 12 MINS, 24 MINS	3 MINS	
SAFE ZONE RING	OFF, ON	ON	
TARGET HISTORY	OFF, 0.5 MIN, 1 MINS, 2 MINS, 4 MINS	OFF	

Target Vector and Predicted Position

The target vector can be True or Relative. True indicates the target's true course and speed over ground. If selected, the vessel's vector is also shown. A Relative vector indicates the target's course and speed relative to your vessel. The length of the vector is determined by the target predicted position after a set time interval.

Safe Zone

The safe zone options are used to set the dangerous target alarm limits.

The safe zone is a ring, centred on your vessel, within which a target is considered dangerous. A target can also be considered dangerous when it is within a specified time of the safe zone. You can switch the safe zone on/off. When the zone is on and a target is acquired, the safe zone ring is displayed.

Target History

Target history can be set to plot the targets' previous position at specified intervals. The four most recent position points are displayed. If True target vectors are selected, then the four most recent vessel position points are also displayed.

5.6 Advanced Settings

The ADVANCED SET UP option allows you to set up values for the following three parameters that affect the fine-tuning of the radar. .

Table 5-6: Advanced Radar Set Up Parameters

Parameters	Function	Slider Range
Display timing	Corrects for display range error	0m to 152.4m
STC preset	Equalizes target levels across display	0-preset maximum
Tune preset	Allows adjustment of the tuning range controlled by the TUNE control	0-255

Note: *Under normal circumstances you will not need to adjust these settings, as they are set automatically at the factory.* ***If these parameters are set incorrectly the performance of the radar will be adversely affected.*** *Access to the menu is therefore via a hidden key press.*

➤ To change the settings:

1. Press the **MENU** key to display the set up soft keys.
2. Press and hold the blank soft key directly to the right of the RADAR SET UP soft key for 5 seconds. The Advanced Settings menu is then displayed.
3. Use the trackpad to move the selection bar to the required option.
4. Use the soft keys to increase or decrease the slider setting. As soon as you start to adjust the setting, the menu page is cleared so that you can see the effects of the adjustment on the radar picture, and the radar is set to 1/8nm range.
5. Press **ENTER** to display the menu again.
6. Press **CLEAR** to return to the Menu soft keys, and **CLEAR** again to return to normal operation.

➤ If required, you can recall the factory defaults for this page. To do so, move the selection bar to the SCANNER RESET option, press the ADVANCED SETTING RESET soft key, and press the YES soft key to confirm.

Display Timing

If you extended the inter-unit cable, you should have set the display timing when you first installed your system, as described in *Radar System Checks and Adjustments* on *page 6-17*.

Under certain circumstances, it may be easier to adjust the display timing with MBS (Main Bang Suppression) off; press the MBS soft key to toggle the setting OFF. MBS is reset to ON automatically when you finish adjusting the display timing.

STC Preset

The Sensitivity Time Control can be adjusted to equalise targets levels across the display. The factory setting should provide an even display, but if you find that targets are brighter or dimmer nearer the centre than at the edge of the display, you can adjust this slider until the required display is achieved.

Note: *Caution should be observed when adjusting this parameter as poor adjustment can adversely affect auto gain and sea controls.*

Tune Preset

The radar tuning is controlled either automatically or manually using the TUNE control (see *Tuning the Receiver* on *page 3-9*). However, this only controls a restricted range of tuning values. If the actual tuning peak falls outside this range, you will need to adjust the Tune Preset slider to move the controlled range over the tuning peak.

Press the INITIATE SET UP soft key to enable slider control, and adjust for maximum image intensity.

If required, you can press the RESTORE PREVIOUS soft key to reset the Tune Preset to the value before you pressed INITIATE SET UP.

Chapter 6: Installation

6.1 Introduction

This chapter provides installation instructions for your SL70 PLUSdisplay. Details for mounting the SL70 PLUSdisplay and connecting the equipment are included. A typical system is illustrated in *Figure 6-1*.

- To install the display unit follow the instructions in *Section 6.2* to *Section 6.6*.
  You should then test the display as described in *Section 6.7*.
- To connect your display to other equipment, follow the guidelines in *Section 6.8* and *Section 6.9*, taking particular care to ensure the correct polarity of the SeaTalk supply.
- **Details on installing the scanner are provided in the** *Pathfinder Plus Radar Scanner Owner's Handbook***.**

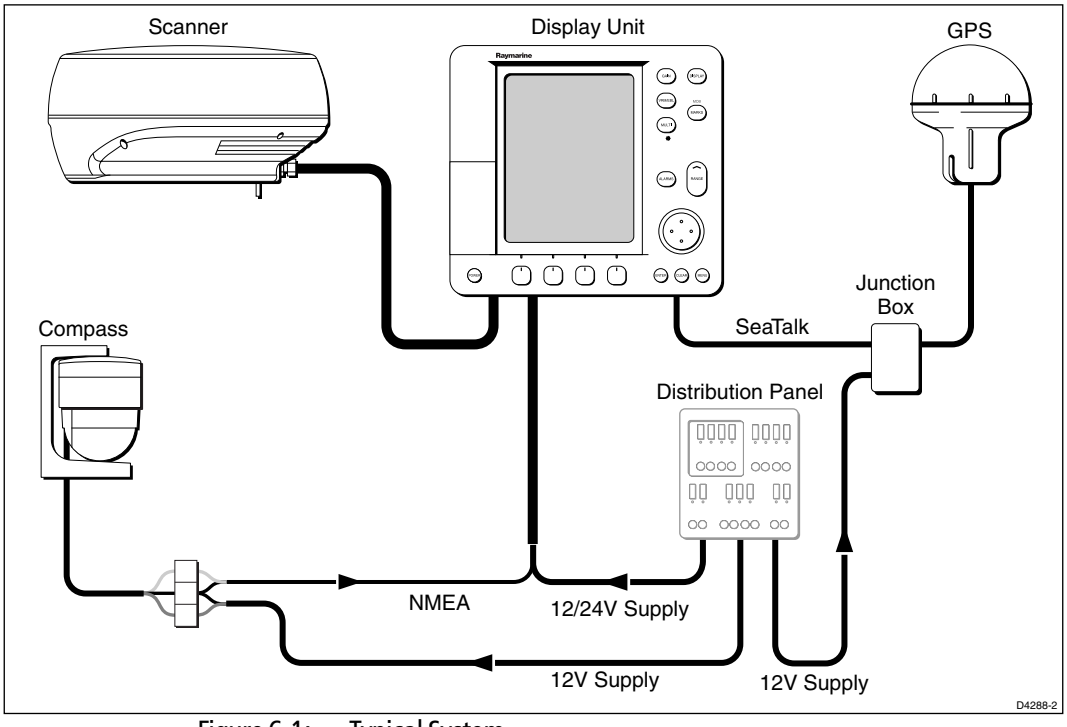


Figure 6-1: Typical System

Note: *If you wish to practice using the display before installation, connect a 12V or 24V DC power supply (connecting the red wire via a 6.3A quick blow fuse to positive and the black wire to negative) and using the simulator mode, as described in Chapter 2.*

For full functionality of the radar you need to provide position and heading data.

- Orientation - heading data is required for the radar to operate in North Up and Head Up mode.
- MOB requires heading and speed data. Alternatively, SOG and COG (derived from the same source as position data) enable the MOB function.
- MARPA requires accurate heading data; full MARPA functionality is provided if SOG and COG are also available.

Full details of heading, position and other data are given in *Section 6.8*.

Planning the Installation

Before you install your system, plan the installation, considering:

- Location of the display unit, as described in *Section 6.3*.
- Cable Runs, including cables for an integrated system (to provide heading and position data etc.), as described in *Section 6.4*.

EMC Installation Guidelines

All Raymarine equipment and accessories are designed to the best industry standards for use in the recreational marine environment.

Their design and manufacture conforms to the appropriate Electromagnetic Compatibility (EMC) standards, but correct installation is required to ensure that performance is not compromised. Although every effort has been taken to ensure that they will perform under all conditions, it is important to understand what factors could affect the operation of the product.

The guidelines given here describe the conditions for optimum EMC performance, but it is recognized that it may not be possible to meet all of these conditions in all situations. To ensure the best possible conditions for EMC performance within the constraints imposed by any location, always ensure the maximum separation possible between different items of electrical equipment.

For **optimum** EMC performance, it is recommended that **wherever possible**:

- Raymarine equipment and cables connected to it are:
  - At least 3 ft (1 m) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft (2 m).

  - More than 7 ft (2 m) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The equipment is supplied from a separate battery from that used for engine start. Voltage drops below 10 V, and starter motor transients, can cause the equipment to reset. This will not damage the equipment, but may cause the loss of some information and may change the operating mode.
- Raymarine specified cables are used. Cutting and rejoining these cables can compromise EMC performance and must be avoided unless doing so is detailed in the installation manual.
- If a suppression ferrite is attached to a cable, this ferrite should not be removed. If the ferrite needs to be removed during installation it must be reassembled in the same position.

Suppression Ferrites

The following illustration shows typical cable suppression ferrites used with Raymarine equipment. Always use the ferrites supplied by Raymarine.

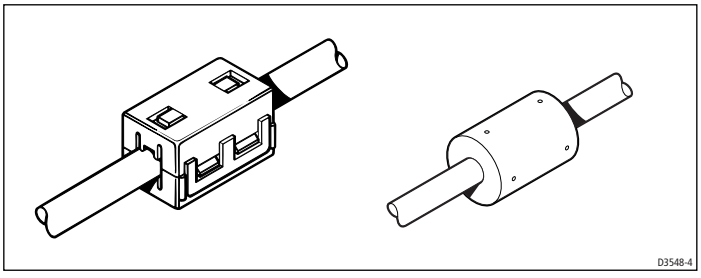


Figure 6-2: Typical Suppression Ferrites

Connections to Other Equipment

If your Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a suppression ferrite MUST always be attached to the cable near to the Raymarine unit.

6.2 Unpacking and Inspecting the Components

Unpack your system carefully, to prevent damage to the equipment. Save the carton and packing, in case you need to return a unit for service.
Check that you have all the correct system components. These depend on your system package, as follows:

Table 6-1: Parts and Accessories

Item	Part No	Supplied with:	Option for:
7" Mono LCD Display	E52043	SL70M PLUS	-
7" Color LCD Display	E52045	SL70C PLUS	-
Display Accessories			
7" Sun cover	D331	SL70M/SL70C PLUS	
Handbook	81205	SL70M/SL70C PLUS	-
Quick Reference Card, Radar	86078	SL70M/SL70C PLUS	-
7" Mounting bracket assy	W143	All	-
Trunnion knobs (x2)	W145	All	-
7" Flush Mount Kit	M92708	-	All
Power cable	W144	All	-
Seatalk cable assembly - Flat moulded plugs both ends:			
3 ft 3 in (1 m) long	W284	-	All
9 ft 9 in (3 m) long	W285	-	All
16 ft 3 in (5 m) long	W286	-	All
29 ft 3 in (9 m)) long	W287	-	All
Flat to male round connector:			
12 in (0.3 m) long	D187	-	All
Flat to female round connector:			
12 in (0.3 m) long	D188	-	All
Flat moulded plug one end only:			
3 ft. 3 in (1 m) long	D229	-	All
Ferrite for SeaTalk Cable	-	All	-
Seatalk junction 3-way block	D244	-	-
Seatalk auxiliary junction box	R55006	All	-
NMEA OUT cable assy			
4 ft 11 in (1.5m)	R55005	All	-

6.3 Selecting the Display Unit Location

The display unit can be mounted using the mounting bracket supplied, or console mounted using the optional flush-mounting kit.

The dimensions of the display unit, including the bracket, are shown in *Figure 6-3*and *Figure 6-4*.

When planning the display installation, the following should be considered to ensure reliable and trouble free operation:

- **Convenience:** The contrast and colors seen on all color LCD displays vary slightly with viewing angle; this is more noticeable on the left hand side. Power the unit and select a suitable mounting location prior to installing the display.
  The mounting location should be easily accessible to allow operation of the front panel controls.
- **Access:** There must be sufficient space behind the display to allow cable connections to the rear panel connectors, avoiding tight bends in the cable.
- **Interference:** The selected location should be far enough away from devices that may cause interference, such as motors, generators and radio transmitter/receivers (see the EMC guidelines earlier in this section).
- **Magnetic compass:** Mount the display unit at least 3 ft (1m) away from a magnetic compass.
- **Cable runs:** The display unit must be located near a DC power source. The power cable supplied is 4.9 ft. (1.5m), but a longer cable can be used if required: refer to *Section 6.4*.

  The maximum length of cable between a master display and the scanner unit should not normally exceed 60 ft. (20 m). If you need to use a longer cable, refer to the *Pathfinder Radar Scanner Owner's Handbook.*
- **Environment: Do not restrict airflow at the rear of the display unit;the color display incorporates Cold Cathode Florescent Lamps (CCFL), which have a reduced light output when the unit is very hot. Ensure there is adequate ventilation, particularly if the display unit is pod-mounted.**
  The display should be protected from physical damage and excessive vibration. Although the display unit is waterproof, it is good practice to mount it in a protected area away from prolonged and direct exposure to rain and salt spray.

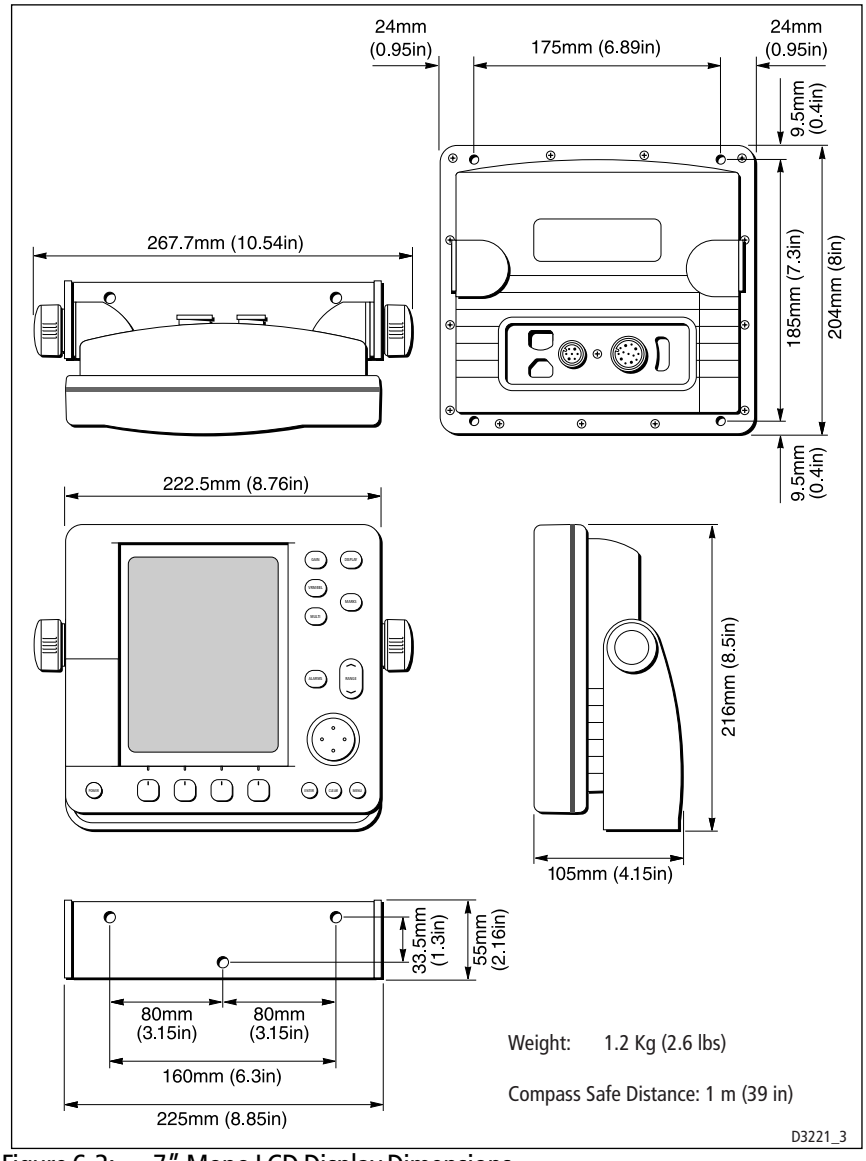


Figure 6-3: 7" Mono LCD Display Dimensions

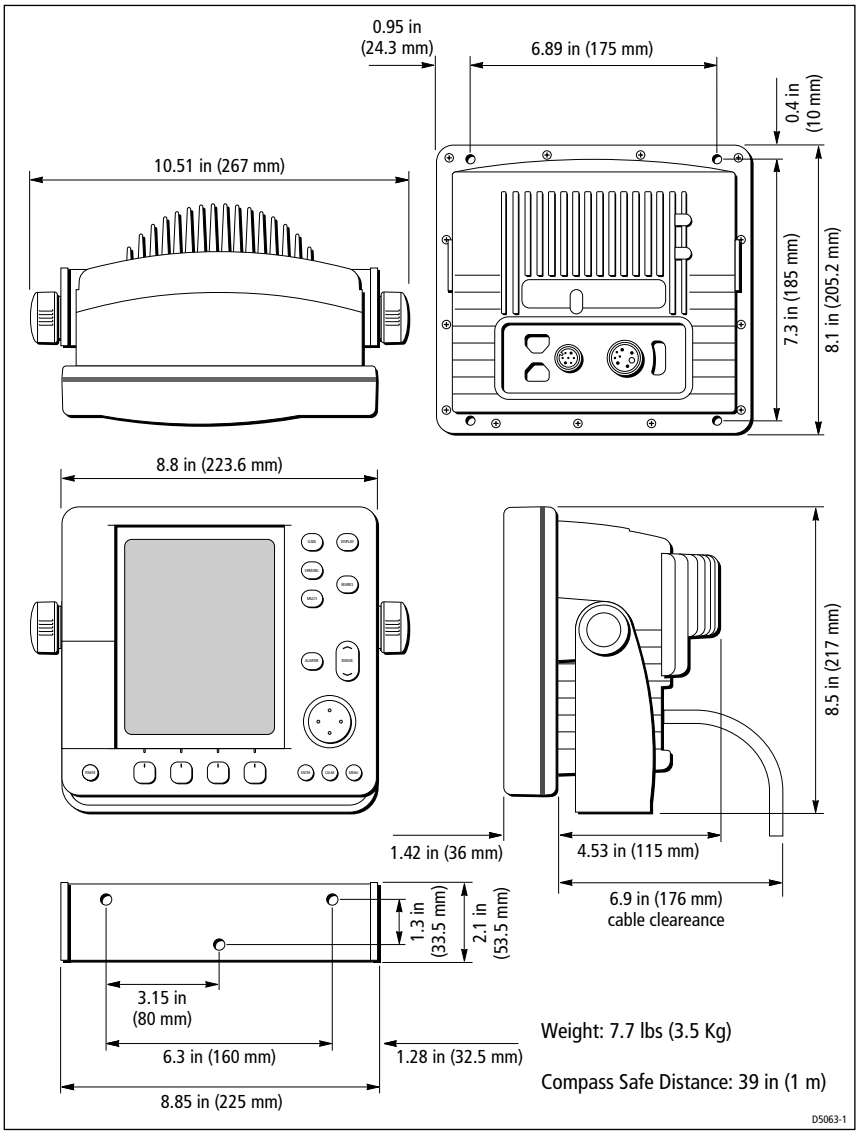


Figure 6-4: 7" Color LCD Display Dimensions

6.4 Cable Runs

Consider the following before installing the system cables:

- You need to attach the power cable and the scanner cable. Additional cables will be required if you are installing an integrated system.
- All cables should be adequately secured, protected from physical damage and protected from exposure to heat. Avoid running cables through bilges or doorways, or close to moving or hot objects.
- Acute bends must be avoided
- Where a cable passes through an exposed bulkhead or deckhead, a water-tight feed-through should be used.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.

You need to run the following cables:

- **Power/NMEA Input cable**, supplied with the display unit. This has a connector plug at one end for connecting the display unit, and 7 wires at the other end for connecting the power supply and optional NMEA inputs (see *Section 6.8, Integrated Systems*).

CAUTION:
Do not pull the cable through the bulkheads using a cord attached to the connector. This could damage the connections.

- **Inter-unit cable**, supplied with the scanner unit. This is Vinyl-covered and shielded, with a connector plug at one end for connecting to the display unit or extension cable.
- **SeaTalk cable**, optional, with SeaTalk connector(s) at one or both ends.
- **NMEA Output cable**, optional, with an NMEA OUT connector at one end only.

Power Cable

The display system (i.e. with a scanner connected) is intended for use onships' DC power systems rated as follows:

12 V or 24 V systems	Radome Scanner System
12 V, 24 V or 32 V systems	4 kW Open Array Scanners System
24 V or 32 V systems	10 kW Open Array Scanners System

A 5 ft. (1.5 m) power cable is supplied for connecting the ship's DC power to the display unit. Longer power cable runs may require larger wire gauges to minimise any voltage drop in the cable. The scanner type and the length and type of the inter-unit cable also affect the wire gauge required for the extension

power cable. For further details on the master display power cable length refer to the *Pathfinder Plus Radar Scanner Owner's Handbook.*

If a longer power cable run is required, use the supplied power cable to connect to the display unit. Then use a suitable connector block to connect the free end to the extension cable, taking particular care to ensure correct polarity. The supplied power cable has a cross-section of 2.0 mm^2.

Inter-Unit Scanner Cable

The inter-unit (scanner) cable entrance is at the rear of the scanner unit. If the unit is mounted on a hollow mast the cable may be run inside the mast and then fed through the radar's cable entrance. Make sure that the cable does not chafe where it enters the mast.

Note: *Route the cable from the display up to the scanner, since this will require the smallest clearance hole.*

The type of inter-unit cable, for connecting the scanner to the display unit, depends on your scanner package. Refer to the *Pathfinder Plus Radar Scanner Owner's Handbook* for details, which include length considerations and bending radii.

6.5 Mounting the Display Unit

The display unit is waterproof to CFR46 and can be installed either above or below deck. The display unit can be mounted using the mounting bracket supplied, or console mounted using the optional flush-mounting kit (see *Section 6.2*).

Mounting Bracket

The display unit can be mounted on a dash, chart table, bulkhead or deckhead.

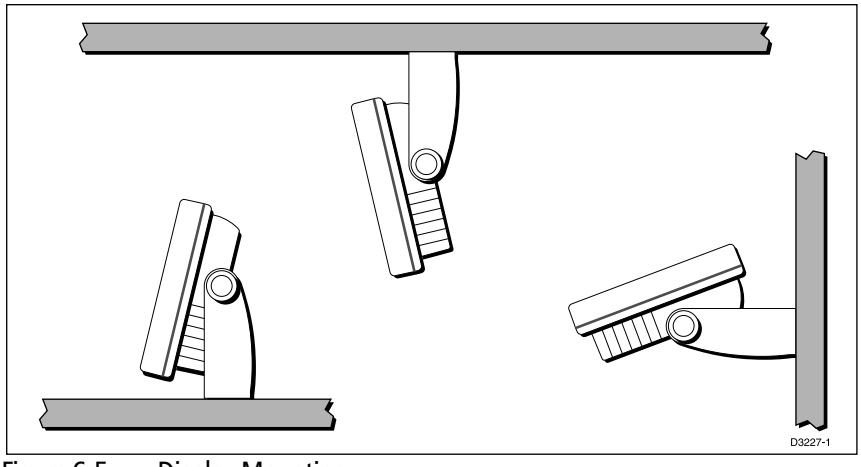


Figure 6-5: Display Mounting

1. Loosen the knobs and remove the mounting bracket from the display unit.
2. Mark the locations of the mounting bracket screw holes on the mounting surface.
3. Use the screws supplied to attach the mounting bracket at the marked locations.
4. Attach the display unit to the mounting bracket, adjust the display angle and tighten the knobs.

Console Mounting

The display unit can be console mounted if required, using the optional flush-mounting kit (M92708).

CAUTION:
Make sure there are no hidden electrical wires or other items behind the location before proceeding. Make sure there is sufficient rear access for mounting and cabling.

1. Check the selected location for the unit. A clear, flat area at least 9 in (230 mm) wide by 8¼ in (210 mm) high, with at least 6 in (152 mm) (mono display) or 6.9in (176 mm) (color display) of clearance behind the panel, is required.
2. Unpack the flush-mounting kit.
3. Using the supplied template, trace out the display unit opening.
4. Drill a ½ in (12.7 mm) pilot hole in each corner of the cut-out area.
5. Using a suitable saw, cut along the inside edge of the cut-out line.
6. Remove the mounting bracket knobs and bracket from the display unit. Make sure that the unit fits in the cut-out area.

   If the optional screw fitting is required, drill four 3/16 in (5 mm) holes as indicated on the template.
   Screw the studs into the holes provided at the rear of the display.
7. Connect the DC power cable, inter-unit cable, and any other accessory cables to the display. Avoid tight bends in the cables.
8. Place the gasket on the unit and slide the unit into the panel cut-out.
9. Use the flush-mounting kit to secure the unit to the console.

   Alternatively, place a spacer over each of the four studs and secure with the thumb nuts.

6.6 System Connections

Grounding the System

It is important that an effective RF ground is connected to the system. You must ground the display by connecting the drain wire (shield) of the Power/ NMEA Input cable to the ship's RF ground; a single ground point should be used for all equipment.

If you need to extend the wire, the extension wire should be an 8 mm braid or AWG 10 (6.0 mm^2) multi-stranded cable.

If your vessel does not have an RF system, connect the drain wire to the negative battery terminal.

DC Power Connection

The display is intended for use on ships' DC power systems rated at 12 V, 24 V or 32 V. However, the operating voltage of the radar and radar/ chartplotter displays is limited by the scanner to which it is connected as follows:

12 V and 24 V systems	Radome Scanner System
12 V, 24 V or 32 V	4 kW Open Array Scanner System
24 V or 32 V	10 kW Open Array Scanner System

The power connection to the display should be made at either the output of the battery isolator switch, or at a DC power distribution panel. Raymarine recommends that power is fed directly to the display via its own dedicated cable system and MUST be protected by a thermal circuit breaker or fuse, installed close to the power connection.

The DC system should be either:

- Negative grounded, with the negative battery terminal connected to the ships ground.
- Floating, with neither battery terminal connected to the ships ground.

CAUTION:
This system is not intended for use on "positive" ground vessels.

The power cable Ground (earth) connections must be connected to the ship's ground as described above.

Power for External Equipment

External equipment cannot be powered from the display's SeaTalk interface.
It must be powered from the ship's supply or via a SeaTalk bus.

Refer to *Section 6.8* for further details.

Display Unit Connection

The rear of the display provides the following connection sockets:

- **Scanner (antenna)** connection
- **SeaTalk**, for SeaTalk data input and output.
- **NMEA Output,** for NMEA data output in an integrated system.
- **Power/NMEA Input**, for 12 V, 24 V or 32 V DC power connection, two NMEA 0183 inputs and one RF ground (screen) connection.

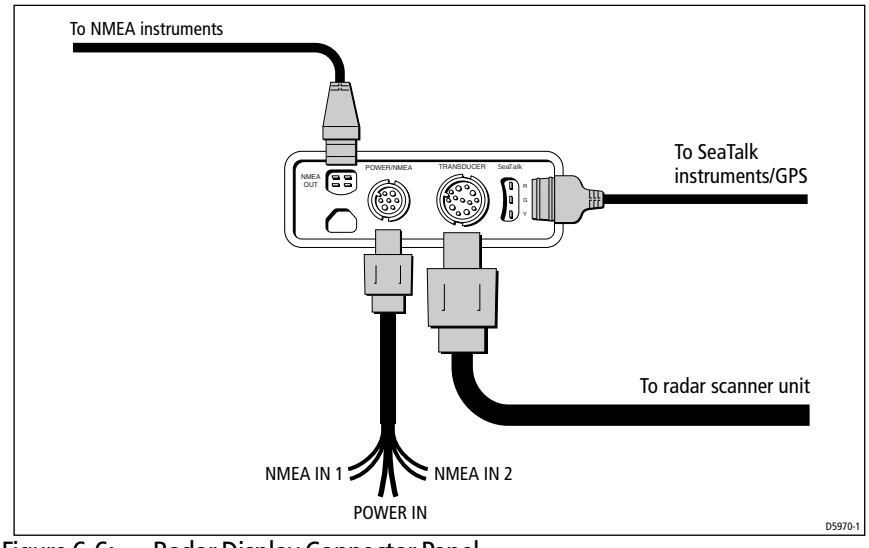


Figure 6-6: Radar Display Connector Panel

The following sections detail the display unit connectors used when installing a display. The remaining connector details are provided in *Section 6.8*.

Scanner Connection (master displays)

Connect the inter-unit cable plug to the rear scanner connector. If you are using an inter-unit extension cable, connect this to the display unit, and connect the supplied cable to the extension cable.

The scanner connector pins are shown in the following diagram, together with the connections and core colours.

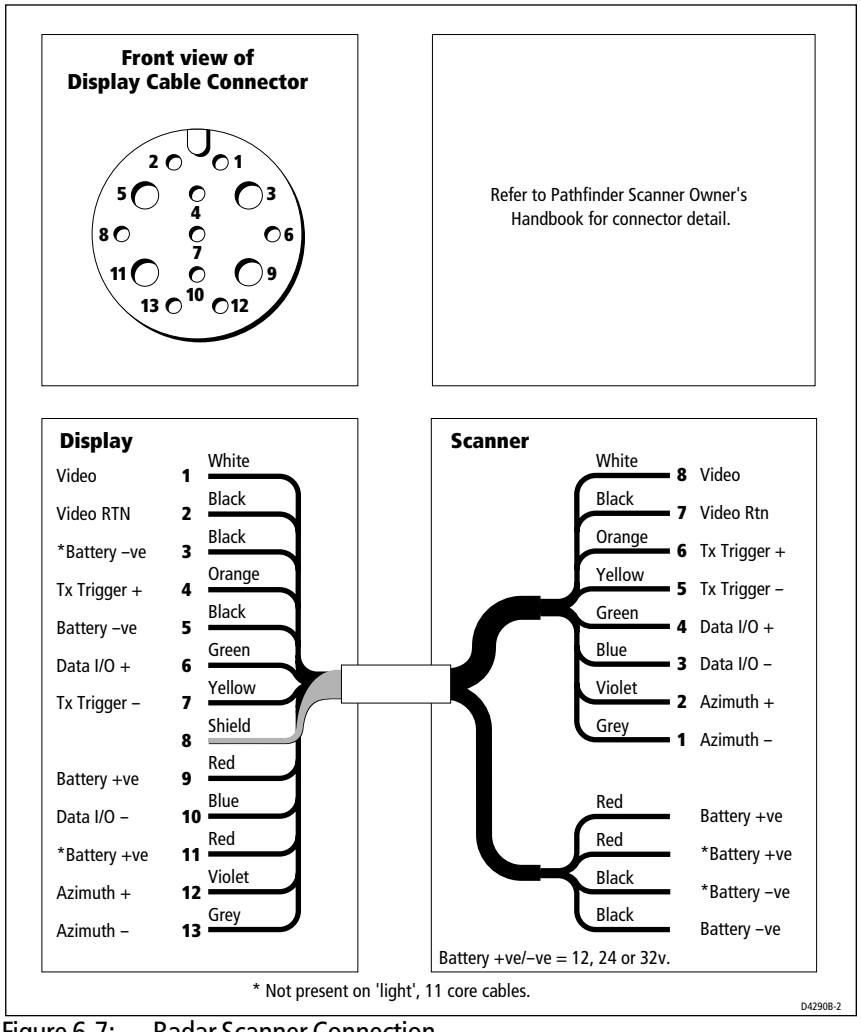
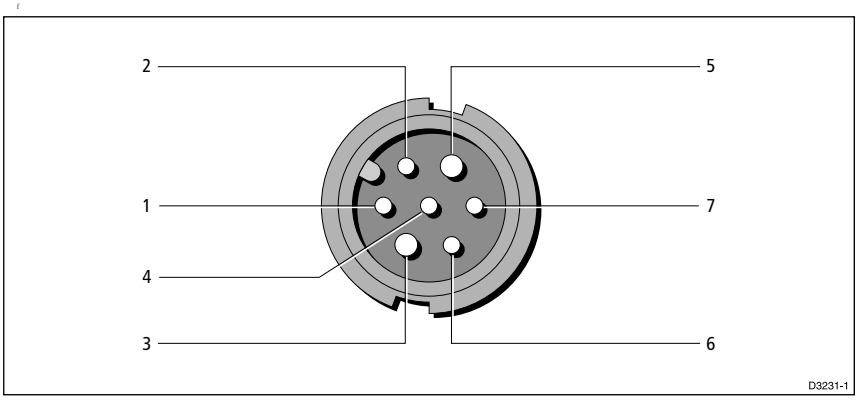


Figure 6-7: Radar Scanner Connection

Power and NMEA Input Connection

The DC power and NMEA input should be connected at the rear Power/ NMEA seven-pin connector. The connector (viewed from the outside) and pin functions are shown in the following diagram and table. The NMEA Input is detailed in *Section 6.8*.



Pin No.	Function	Color
1	Channel 1 NMEA data input (+ve)	Orange
2	Channel 1 NMEA return (-ve)	Yellow
3	Battery negative	Black
4	Shield (drain wire)	No insulation
5	Battery positive (12/24/32 V systems)	Red
6	Channel 2 NMEA data input (+ve)	Green
7	Channel 2 NMEA return (-ve)	Blue

Figure 6-8: Power and NMEA Connector

Power Connection

CAUTION:

If the power connections are accidentally reversed the system will not work. Use a multimeter to ensure that the input power leads are connected for correct polarity.

Switch off the display unit before you remove the power cord.

The RED wire must be connected to the feed from the positive (+) battery terminal and the BLACK wire to the feed from the negative (–) battery terminal. The shielded wire (screen) should be connected to the ship's RF ground as previously described in *Grounding the System* on *page 6-12*.

Any unused wires should be insulated and taped back.

6.7 Radar System Tests and Installation Alignment

Once you have installed your Pathfinder Plus Radar System and made all the connections, you need to check your installation and perform the *System Checks* before using the system for navigation. It is strongly recommended that the System Checks are performed before connecting the display to other equipment in an integrated system. If you have extended your inter-unit cable, you will also need to check the display timing. If you encounter any problems, refer to *Chapter 7*.

You may wish to read *Chapters 2 to 4*, and familiarise yourself with the operation of the system, before performing the initial set up and alignment.

System Check

Before performing the functional test, check the following:

- All securing bolts are fully tightened and mechanical locking arrangements as specified are in place.
- Scanner and power connections have been made.
  On the open array scanner, set the power switch (on the pedestal) ON.
- All connecting wires are secured and protected as necessary.

Note: *If you are the boat owner and have performed the installation yourself, ask your authorised installation dealer to check the installation before going to sea.*

Switch On and Initial Setup

To switch on the display unit, press and hold the **POWER** key until the unit beeps. Since the display is a radar master, the magnetron warm-up sequence should start, after which the unit should enter Stand-by mode.

The display switches on in the last used mode. If it is necessary to change the mode, press **DISPLAY** to show the Display pop-up. Press **DISPLAY** again, as necessary, to select Radar mode, then press **ENTER**.

If necessary, adjust the lighting (see *Changing the Lighting & Contrast - SL70M Mono Display* on *page 2-5* or *Changing the Brightness - SL70C Color Display* on *page 2-6*).

If required, change the default language settings as follows:

1. Press the **MENU** key to display the setup soft keys.

2. Press the SYSTEM SET UP soft key.
   The SYSTEM SET UP menu is displayed, listing the parameters and their cur-

rent settings. The complete list, which you can scroll down, is shown in the following illustration.

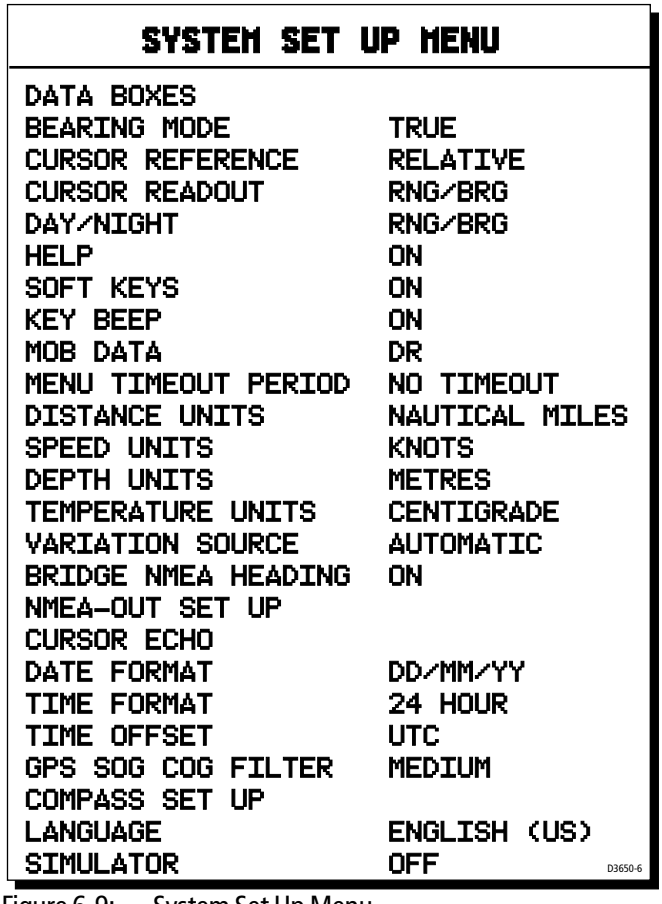


Figure 6-9: System Set Up Menu

3. Use the trackpad to move the selection bar down to the LANGUAGE option. The soft key labels are updated.
4. Use the soft keys to highlight the required language.
5. Press **ENTER** to return to the setup soft keys.
6. Press **CLEAR** to return to the normal screen.

Radar System Checks and Adjustments

When the display is connected to a scanner unit you should perform the checks and adjustments detailed below.

Transmission Check

WARNING:
The radar scanner transmits electromagnetic energy. Ensure that the scanner has been installed according to the recommendations given in the *Pathfinder Plus Radar Scanner Owner's Handbook,* and that all personnel are clear of the scanner, before switching to transmit mode.

Ensure the display unit is in Radar mode.

To switch to transmit mode, press and release the **POWER** key. The antenna sweep should start to build up the radar picture.

Run through the operations described in *Chapter 3* and check that all the expected data is displayed.

Bearing Alignment

When the system is correctly installed, you must check the bearing alignment to ensure that targets appear at their correct bearing relative to the ship's bow, and adjust the alignment if necessary.

To adjust the alignment, you need to select a visible target of known bearing that is displayed on the radar, and then use the setup options to adjust the radar until the correct bearing reading is obtained.

➤ To determine the alignment error, use one of the methods detailed below.

1. Visually identify a suitable target, such as a buoy that can be seen towards the edge of the radar screen. Typically, this will be on the 1.5 nm range.
2. **If the vessel is moored**:
   i. Determine the accurate bearing of the target relative to the ship's bow with the aid of a hand bearing compass. i.e. Subtract the ship's head bearing from the target visual bearing.

   Example 1
   Visual bearing= 065 °M
   Ship's head= 021°M
   Relative bearing= 044°R

   Example 2
   Visual bearing = 030°M
   Ship's head= 042°M
   Relative bearing= -012°(+360) = 348°R

   ii. Measure the relative bearing of the target on the radar using an EBL.
   iii. If there is a difference in the two bearings (alignment error), adjust the radar as detailed below.

   If the vessel is under way (in reasonably calm conditions):
   i. Align the vessel's bow to the target.
   ii. Note the position of the target relative to the Heading marker.
   iii. If the target is **not** under the Heading marker, there is an alignment error and the radar can be adjusted as detailed below.

➤ To adjust the radar to eliminate the alignment error:

1. If a visual relative bearing of a target has been determined, as in 2.1 above, set an EBL to this relative bearing.
2. Press the **MENU** key to display the setup soft keys and select RADAR SET UP.

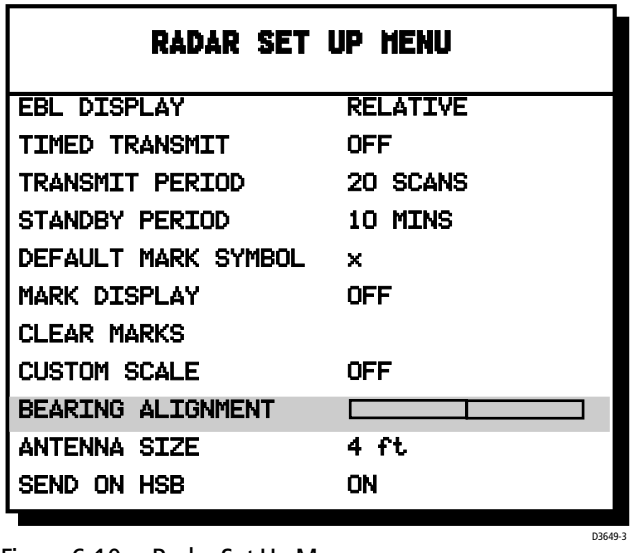


Figure 6-10: Radar Set Up Menu

3. Use the trackpad to move the selection bar on the Radar Set Up Menu to BEARING ALIGNMENT.
4. Use the soft keys to adjust the Bearing Alignment slider and to rotate the radar picture. As soon as you start the adjustment, the menu is cleared so that the rotation of the picture can be seen. The keys can pressed and held, to rotate the picture quickly, rather than in single steps.
5. Rotate the picture to place the target under the EBL, or Heading Marker, depending on the method used to obtain the correct relative bearing.
6. When the bearing alignment error has been eliminated press **ENTER** to re-display the Radar Set Up menu.
7. Press **ENTER** again to return to the set up soft keys, then press **CLEAR** to return to the normal radar screen.
8. After adjusting the radar, always check the bearing alignment at the next opportunity. Usually the bow alignment to target is the most convenient method, see *If the vessel is under way (in reasonably calm conditions):* on *page 6-18*.

Display Timing Adjustment

The display timing can be affected by the length of the cable used to connect the scanner to the display unit. This in turn affects the short range accuracy shown on the display. If you have extended (or reduced) your inter-unit cable,

you will need to check the display timing before using the system for navigation.

Incorrect timing is most noticeable on the 1/8 nm or ¼ nm range scales. Targets such as bridges or piers appear bent or bowed.

Note: *Under normal circumstances you do not need to adjust these settings, as they are set automatically at the factory.* ***If these parameters are set incorrectly the performance of the radar will be adversely affected.*** *Access to this menu is therefore via a hidden key press.*

➤ To adjust for correct timing:

1. Select the 1/8 nm range.
2. On the radar locate a straight dock, seawall or bridge that is facing your ship. If the image is bent or bowed, as shown in the following diagram, then you need to adjust the timing.

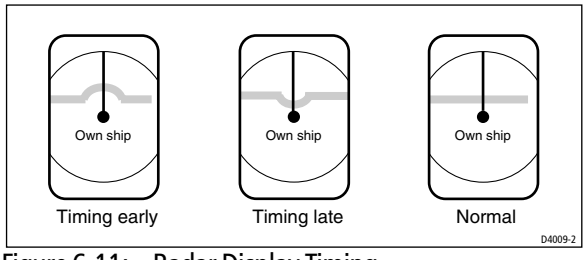


Figure 6-11: Radar Display Timing

3. Press the **MENU** key to display the set up soft keys.
4. Press and hold the blank soft key directly to the right of the RADAR SET UP soft key for 5 seconds. The Advanced Set Up menu is then displayed.
5. Use the trackpad to move the selection bar down to the Display Timing option.
6. Use the soft keys to adjust the Display Timing slider. As soon as you start the adjustment, the menu page is cleared so that you can see the effects of the adjustment on the radar picture, and the radar is set to 1/8 nm range.
7. When the displayed image appears straight, press **ENTER** to return to the Advanced Set Up soft keys.
8. Press **CLEAR** to return to the set up soft keys, and **CLEAR** again to return to the normal radar screen.

Alternatively, you can use a VRM in conjunction with a target at a known distance and adjust the picture so the target co-incides with the VRM.

EMC Conformance

Always check the installation before going to sea to make sure that it is not affected by radio transmissions, engine starting etc.

6.8 Integrated Systems

The displays can be linked to other equipment to transfer data as follows:

- Data can be received via SeaTalk or NMEA, some of which will increase the functionality of the display. Other data can be viewed on the display.
- Data can be transmitted via SeaTalk and NMEA to enhance other equipment.
- Some incoming data can be converted across the communication link and re-transmitted - see *Data Conversion* on *page 6-27*.

Power for External Equipment

External equipment cannot be powered from the display's SeaTalk interface. It must be powered from the ship's supply or via a SeaTalk bus. Ensure correct polarity of the SeaTalk connection.

For systems where the ship's power source is 24 V only, you may need to install a 24 V to 12 V DC converter. This is only necessary if the products being connected to the display are:

- SeaTalk compatible (for example, compass, GPS and instruments), and there is no existing SeaTalk bus
- NMEA compatible, but operate only from 12 V (for example, compass, GPS and some navigators)

The DC~DC converter must conform to the following specification:

Table 6-2: DC-DC Converter for External Equipment

Input	21 to 32 V DC
Output	13.6 V DC, isolated
Load	Continuous current rating, in excess of required load

SeaTalk® and NMEA In

The display can receive a comprehensive range of data. The primary data is described below:

Table 6-3: Function of SeaTalk and NMEA Data

Data	Primary Uses	Suggested Source
Heading	Heading Modes MOB (if Speed data also available) MARPA (radar)	Autopilot, Compass connected to SeaTalk bus NMEA Compass*
Position	MOB (also requires speed and HDG data) Position data in data box and Nav Window Waypoints & Marks Own vessel position (chart) Data Log (chart)	SeaTalk GPS connected via Auxiliary JB Existing GPS Navigator via SeaTalk bus Existing GPS (or Loran-C) navigator with NMEA output
Waypoint	Waypoint transfer	Existing GPS Navigator via SeaTalk bus Existing GPS (or Loran-C) navigator with NMEA output

*Accurate heading data is required for MARPA, and it must be provided on NMEA. We recommend the Pathfinder Smart Heading System (which includes the Gyro Plus 2 unit) or a Raymarine autopilot system incorporating a 150G or 400G Course Computer with internal rate gyro.

Heading data should ideally contain both magnetic and true heading. If only one is available then variation needs to be provided either manually or automatically - see *Variation Source* on *page 5-8*.

Some other radars and chartplotters can exchange their cursors via SeaTalk.

Locked heading should be used for Course Up if available via SeaTalk.

Other data connected via a SeaTalk bus or via NMEA is generally displayed in data boxes, e.g. depth, apparent wind angle and speed, time.

Note: *The Raymarine Fishfinder uses its own depth data, rather than any other depth data on SeaTalk. If there is no other depth data on SeaTalk, Fishfinder depth is transmitted. If speed and temperature data are available on SeaTalk the Fishfinder uses this data; if this data is not on SeaTalk from other instruments, it is transmitted by the Fishfinder.*

For details of received data refer to the table in *Appendix B:SeaTalk and NMEA Data Received and Transmitted*.

SeaTalk

The SeaTalk standard was originally developed by Autohelm (part of Raymarine), and allows compatible instruments to be connected by a single cable carrying power and data in/out. This means that additional instruments and functions can be added to a SeaTalk system, simply by plugging them into the network.

SeaTalk is a precise, high-speed, bi-directional protocol which is flexible enough to adapt to any number of instruments, without a central processor. SeaTalk equipment can also communicate with non-SeaTalk equipment via the NMEA standard.

SeaTalk Connection

SeaTalk data, if present, is the primary source for all navigational data except heading.

The SeaTalk input/output should be connected at the rear SeaTalk 3-pin connector. This appears as follows, when viewed from outside:

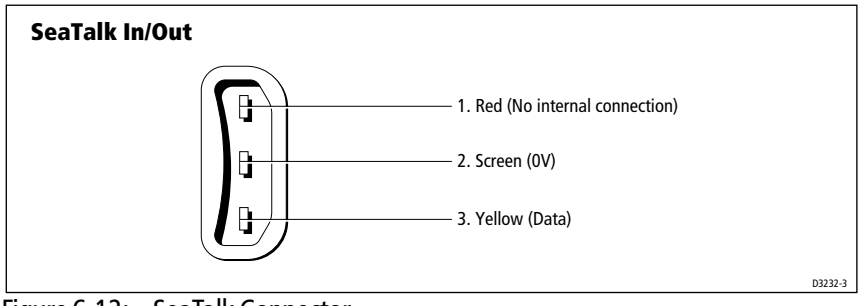


Figure 6-12: SeaTalk Connector

Table 6-4: Sea Talk Connections

Pin No.	Function	Color
1	+12 V	Red
2	0 V	Shield
3	Data	Yellow

Note:

1. *If you use the SeaTalk connector you must fit the supplied ferrite to the cable for EMC CE conformance. The ferrite must be clipped to the cable as close to the connector as possible.*

2. *The display does not supply 12 V via the SeaTalk connector, neither does the SeaTalk connector require 12 V to operate.*

12 V is required for other SeaTalk units.

3. *If you are connecting an active compass to the radar, the NMEA input has*

priority. You should, therefore use an NMEA input channel (see Power and NMEA Input Connection) rather than the SeaTalk interface, unless the compass only has a SeaTalk output.

To connect the display unit to the SeaTalk bus, connect a standard SeaTalk cable between the SeaTalk connector on the rear of the display and a SeaTalk instrument or the SeaTalk bus.

Standard SeaTalk cables are available in a range of lengths (part numbers W284 to W287), and cables for connecting to SeaTalk units with round connectors are also available (part numbers D187 or D188), see *Section 6.2* for further details.

NMEA 0183

The NMEA 0183 Data Interface Standard was developed by the National Marine Electronics Association of America. It is an international standard that enables equipment from many different manufacturers to be connected together and to share information.

The information is passed in "sentences", each of which has a three-letter sentence identifier. When you check to see if one item will "talk" to another, make sure that the two items both use the same sentence identifiers. For example: VTG carries Course and Speed Over Ground data; GLL carries latitude and longitude; DBT carries water depth; MWV carries relative wind angle and wind speed data.

The NMEA 0183 standard carries similar information to SeaTalk. However, it has the important difference that one cable will only carry information in one direction. For this reason NMEA 0183 is generally used to connect a data receiver and a transmitter together: for example, a compass sensor transmitting heading to a radar, or a GPS sensor (or Chartplotter) transmitting position and navigation data to a radar.

NMEA Input Connection

The two NMEA/Power input connectors are normally used for non-SeaTalk Compass (heading) data or GPS. It can also be used for additional navigation data (if not provided via SeaTalk).

Connect the input(s) to the orange and yellow wires (Channel 1) and/or the green and blue wires (Channel 2). Refer to *Power and NMEA Input Connection* on *page 6-15* for further details.

For example, to connect a Raymarine Heading Sensor to the NMEA Channel 1 input, connect the cables and power supply using a suitable connector block, as shown in the diagram below. If installed, it may be

convenient to connect the power to the SeaTalk auxiliary junction box described in the following section.

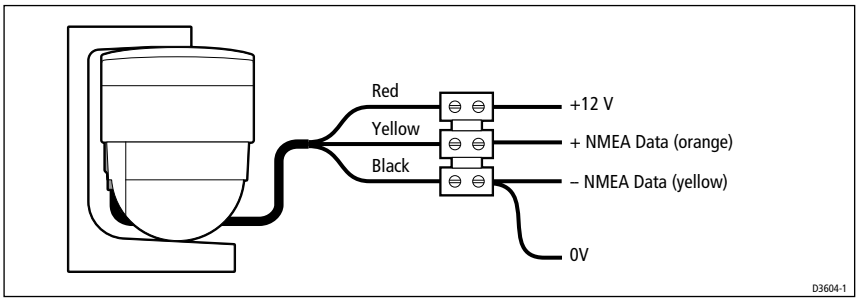


Figure 6-13: NMEA Input Connection

Using the SeaTalk Auxiliary Junction Box

A junction box (optional with the radar display) is used to connect the SeaTalk system to the display unit. This junction box enables the SeaTalk bus, power and GPS to be connected.

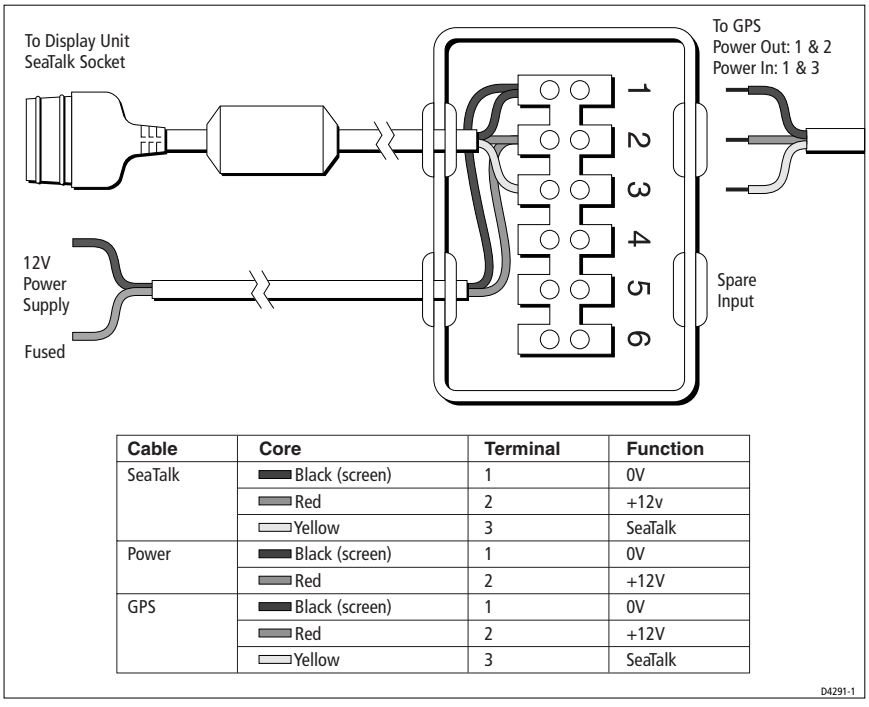
If power is not already available (via another SeaTalk instrument), the junction box can be used to apply power to the SeaTalk bus for other applications. The junction box may also be used for other purposes, e.g. supplying power to a flux gate compass and routing the compass data to the display NMEA In connection, or alternatively, for connecting a NMEA GPS system.

The junction box includes:

- SeaTalk cable and connector to attach to display unit
- Power cable to connect to 12 V power (if required)
- Input connections to connect SeaTalk cable from external equipment
- Spare connections for another instrument

CAUTION:
Ensure correct polarity of the 12 V supply before applying radar or SeaTalk power. It is recommended that a multimeter is used to check the connections.

Figure 6-14 shows how to connect the junction box; *Appendix B* provides connection details for specific GPS and Beacon Receiver systems.



Cable	Core	Terminal	Function
SeaTalk	Black (screen)	1	0V
	Red	2	+12v
	Yellow	3	SeaTalk
Power	Black (screen)	1	0V
	Red	2	+12V
GPS	Black (screen)	1	0V
	Red	2	+12V
	Yellow	3	SeaTalk

Figure 6-14: Using the Auxiliary Junction Box

Data Output

Data is transmitted in SeaTalk and NMEA formats as detailed in *Appendix D* and can be used to enhance other equipment as required. You can disable the transmission of individual NMEA output sentences - refer to *NMEA Out Set Up* on *page 5-9*.

The SeaTalk input/output connection is detailed in *SeaTalk Connection* on *page 6-23*.

The NMEA output connector is a 4-pin connector as illustrated below. The 1.5 m NMEA OUT cable has a ferrite clamp attached to ensure EMC conformance.

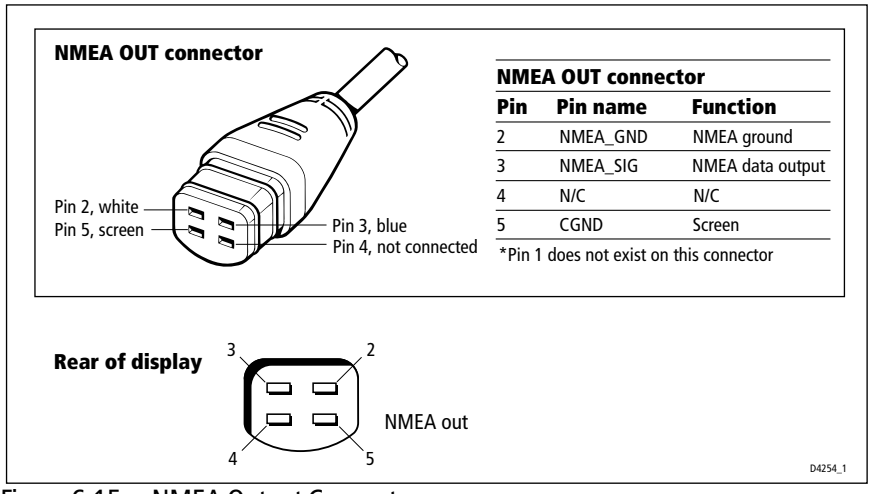


Figure 6-15: NMEA Output Connector

Data Conversion

The displays convert some information across the communications links as follows:

NMEA In to NMEA Out and SeaTalk
SeaTalk to NMEA Out

This enables data received by the display to be passed to other instruments.

You can prevent NMEA heading data being bridged onto the Seatalk bus - refer to *Bridge NMEA Heading* on *page 5-9*.

Note: *To transfer NMEA data, or to convert the data, the display must be powered On.*

6.9 Integrated System Checks

Received Data

If either SeaTalk or NMEA In is connected, verify that the expected data is displayed.

1. Press **DISPLAY** and select the NAV DATA WINDOW ON.
   Check that the expected data is displayed.
2. If heading data is connected select Radar mode and check heading is displayed in the Status Bar.

Transmitted Data

If SeaTalk or NMEA Out is being transmitted to other equipment, check that the data is being received correctly.

An NMEA Out connector is used to transmit navigation data. The NMEA Output cable should be connected to the upper, left connector on the rear of the display unit.

Note: *The NMEA Output cable has a ferrite clamp attached to ensure EMC conformance.*

Chapter 7: Maintenance and Problem Solving

This chapter provides information on routine maintenance and on possible causes of problems you may experience with your display unit.

7.1 Maintenance

WARNING:
The display unit contains *high voltage*. Adjustments require specialized service procedures and tools only available to qualified service technicians - there are no user serviceable parts or adjustments and the operator should not attempt to service the equipment. *The operator should not remove the rear cover of the display.*

Switch off the display unit before removing the power cord.

Routine Checks

The display is a sealed unit. Maintenance procedures are therefore limited to the following periodic checks:

- Wipe the display clean with a damp cloth (ensure power is off).
- Examine the cables for signs of damage, such as chafing, cuts or nicks.
- Check that the cable connectors are firmly attached.

Cleaning Instructions - SL70C

Cleaning the Display

CAUTION:
Take care when cleaning the display. Avoid wiping the display screen with a dry cloth - this could scratch the screen coating.
Do not use acid, ammonia based or abrasive products.

- Ensure power is off, wipe the display clean with a damp cloth.
- If necessary, use IPA (iso-propyl alcohol) or a mild detergent solution to remove grease marks.

EMC Servicing and Safety Guidelines

- Raymarine equipment should be serviced only by authorized Raymarine service technicians. They will ensure that service procedures and replacement parts used will not affect performance. There are no user serviceable parts in any Raymarine product.

- Some products generate high voltages, so never handle the cables/connectors when power is being supplied to the equipment.
- When powered up, all electrical equipment produces electromagnetic fields. These can cause adjacent pieces of electrical equipment to interact with one another, with a consequent adverse effect on operation. In order to minimise these effects and enable you to get the best possible performance from your Raymarine equipment, guidelines are given in the installation instructions, to enable you to ensure minimum interaction between different items of equipment, i.e. ensure optimum Electromagnetic Compatibility (EMC).
- Always report any EMC-related problem to your nearest Raymarine dealer. We use such information to improve our quality standards.
- In some installations, it may not be possible to prevent the equipment from being affected by external influences. In general this will not damage the equipment but it can lead to spurious resetting action, or momentarily may result in faulty operation.

7.2 Resetting the System

There are three types of reset available for the display:

- **Factory Reset:** This resets **all** values back to their original factory settings.

CAUTION:
The factory reset clears the Marks database.

- **Power-On Reset:** When you turn the display off and on again, the screen reverts to the radar picture with all windows cleared.
- **Picture Reset:** Press and hold the **DISPLAY** key for two seconds to return the screen to the full-screen picture of the top window with all windows cleared.

At power-on, the last-used values are retained for all the options, except for those listed in the following table which are reset to the factory default each time.

Table 7-1: Power On Default Settings

Item	Power-on setting
Heading Mode	Head Up (radar);
Rain	OFF (but value stored) – radar only
FTC	OFF (but value stored) – radar only
Alarm	ON, with last-used value
Zoom	OFF
Windows	OFF
Lighting & contrast (mono display)	Lighting 40%, contrast 50%
Brightness (Color Display))	ON at 100%.

➤ To perform a factory reset:

1. Press **MENU**.
2. Press the SYSTEM SET UP soft key to display the System Set Up page (see *Section 5.3* for details).
3. Press and hold **MENU** for 5 seconds.

   A countdown timer is displayed. If you release the **MENU** key before the timer reaches zero, the reset is not performed.

   When the reset request has been accepted, the system restarts.

The factory default settings are listed in *Section 5.3*

7.3 Problem Solving

All Raymarine products are, prior to packing and shipping, subjected to comprehensive test and quality assurance programs. However, if this unit should develop a fault, please refer to the following table to identify the most likely cause and the corrective action required to restore normal operation.

If you still have a problem after referring to the table below, contact your local dealer, national distributor or Raymarine Technical Services Department for further advice.

Always quote the product serial numbers. The display unit serial number is printed on the back of the unit.

Common Problems and Their Solutions

Table 7-2: Common Problems

Problem	Correction
Display does not function	1. Make sure that the power supply cable is sound and that all connections are tight and free from corrosion. 2. Check the system fuse.
"Scanner not responding" message	Check that the cable connecting the scanner to the radar display unit is firmly attached and undamaged.
The bearing displayed on the radar display is not the same as the actual bearing.	Perform the bearing alignment procedure described in *Section 6.7, Radar System Tests and Installation Alignment*

Technical Support:

Please visit out website at:

www.raymarine.com/recreational/support

where you will find a Questions & Answers database, service information and e-mail access to the Technical Support department.

Alternatively, if you don't have access to the world wide web, call:

1-800-539-5539 extension 2444 or
(603) 881-5200 extension 2444

Our Technical Support Specialists are available to answer questions about installing, operating and trouble-shooting all Raymarine products.

How to Contact Raymarine (US)

For Marine Product and Services Information

Visit the Raymarine World Wide Web site for the latest information on the newest Raymarine electronic equipment and systems at:

www.raymarine.com

For Accessories and Parts

Many Raymarine accessory items and parts can be obtained directly from your authorized Raymarine dealer. However, if you are in need of an item not available from the retailer, please contact Raymarine Technical Services at:

1-800-539-5539 extension 2333 or (603) -881-5200.

Technical Service is available Monday through Friday 8:15 AM to 5:00 PM Eastern Standard Time.

Please have the Raymarine item or part number ready when calling if placing an order. If you are not sure which item is appropriate for your unit, you should first contact the Technical Support Department at:

1-800-539-5539 ext. 2444 or

(603)-881-5200 to verify your requirements.

For Product Repair and Service

In the unlikely event your Raymarine unit should develop a problem, please contact your authorized Raymarine dealer for assistance. The dealer is best equipped to handle your service requirements and can offer timesaving help in getting the equipment back into normal operation.

In the event that repairs can not be obtained conveniently, product service may also be obtained by returning the unit to:

Raymarine Product Repair Center
22 Cotton Road, Unit D
Nashua, NH 03063-4219

The Product Repair Center is open Monday through Friday 8:15 a.m. to 5:00 p.m. Eastern Standard Time or Eastern Daylight Savings Time. All products returned to the Repair Center are registered upon receipt. A confirmation letter will be sent to you acknowledging the repair status and the product's reference number. Should you wish to inquire about the repair status of your unit, contact the Product Repair Center at:

1-800-539-5539

Please have the product reference number, or unit serial number, ready when you call. We will do everything possible to make the repair and return your unit as quickly as possible.

How to Contact Raymarine (Europe)

In Europe, Raymarine support, service and accessories may be obtained from your authorised dealer, or contact:

Raymarine Company
Anchorage Park, Portsmouth
PO3 5TD, England
Tel +44 (0)23 9269 3611
Fax +44 (0)23 9269 4642

Or visit the Raymarine World Wide Web site:

www.raymarine.com

Accessories and Parts

Raymarine accessory items and parts are available through your authorized Raymarine dealer. Please refer to the lists of component part numbers and optional accessories in the Installation chapter of this manual, and have the Raymarine part number ready when speaking with your dealer.

If you are uncertain about what item to choose for your Raymarine unit, please contact our Customer Services Department prior to placing your order.

Worldwide Support

Please contact the authorized distributor in the country. A list of worldwide distributors is supplied with your system.

Appendix A: Specification

7" SL70 PLUS Series Displays

General

Approvals:		
CE - conform to		1999/5/EC, EN60945:1997
FCC - conforms to		Part 80 (47CFR) and Part 2 (47CFR)
Size:	7″mono	223 x 204 x 75mm (8.8" x 8" x 3"), excluding bracket
	7″ color	223 x 205 x 152 mm (8.8" x 8.1 " x 6"), excluding bracket
Weight	7″mono	1.2 kg(2.6lbs)
	7″ color	3.5 kg (7.7 lbs)
Mounting		Bracket with panel mount option
Power		External 10.7 - 44 V DC required Floating earth/fully isolated
	7"mono	10 W consumption with full backlighting
	7″ color	20 Wmax. consumption with full brightness
Environmental:		Waterproof to CFR46; suitable for external mounting
Op/Storage Temp. Range -mono		-10°C to +70°C
	- color	-10°C to +50°C
Humidity limit		up to 95% at 35°C non-condensing
Controls		11 defined keys, 4 soft keys and trackpad
Cursor		Context sensitive, provides range/bearing or lat/lon
Display Type: - mono		7" Film Super Twist Neumatic (FSTN) LCD, monochrome with 4 gray scales
	- color	color TFT LCD
Resolution:	7"mono	320 x 240 (1/4 VGA)
	7″ color	640 x 480 (VGA)
Display Size	7"mono	7" diagonal - 143 mm x 111 mm
	7" color	136 mm x 100 mm
Mono LCD Contrast		100 levels, selectable via soft keys.
Languages		UK English, US English, Danish, French, German, Dutch, Italian, Icelandic, Norwegian, Portuguese, Spanish, Swedish, Finnish
Connectors		13 pin scanner 3 pin SeaTalk input/output 4 pin NMEA output 7 pin power including 2 NMEA input channels
Interfaces		1 x SeaTalk, receive and transmit 1 x NMEA 0183, transmit 2 x NMEA 0183, receive

Cursor Echo	Cursor Echo between radar and chart on separate displays connected via SeaTalk.
Man Overboard (MOB Mode)	Mark placed with course line; readout shows range, bearing, lat/lon of MOB and time elapsed since MOB.
Screen Functions	Full, half and quarter screens available dependent on function
Data Boxes	Up to six user selectable information boxes

Radar Features

Range Scales (Range Rings)	0.125 (0.0625), 0.25 (0.125), 0.5 (0.125), 0.75 (0.25), 1.5 (0.25), 3 (0.5), 6 (1), 12 (2), 24 (4), 48 (8) or 72 (12) nm selectable (dependent on scanner). Performance limited by the scanner type andposition. Range scales can be customized
Range Ring Accuracy	Better than +/– 1.5% of the max. range scale in use, or 22 m (72 ft.), whichever is the greatest.
Bearing Accuracy	+/– 1°
Variable Range Markers	2xVRMs, readout nm, kyds, sm, km
Electronic Bearing Lines	2xEBLs, floating if required, resolution 1°
Bearing Scale	360° graduated at 10° intervals
Minimum Range	23 m (25 yds)
Range Discrimination	23 m (25 yds)
Presentation Modes	Head up, Course up or North up (selectable True or Magnetic) Relative or True Motion
Scanner Control	Interference rejection, standby/transmit modes, pulse selection, Tune, Rain, FTC, and Sea controls, with selection of manual or automatic control of gain, sea clutter and tune (Auto GST™)
Magnetic Sensor	NMEA or Seatalk
Waypoint Navigation	Lollipop symbol, WPT range, bearing, TTG or lat/lon readout
Marks	100 Mark database
MARPA	Manual acquisition of 10 targets, automatic tracking, dangerous target alarms, safe zone, target history, true or relative vectors
Variation Source	Auto (SeaTalk/NMEA/Internal algorithm) or Manual
Guard Zone Alarm	2 guard zones, selectable sensitivity level, audible alarm
Zoom Mode	x2, from 0.25 nm to maximum range, in 1/4 window and - color display only - full screen from 1/4 window
Off Centre Function	66% of radius (except maximum range)
Display Windows	Radar, CDI, BDI and Navdata

Wakes	Short, medium, long, off
Target Expansion	Operator selectable
Timed TX	Rotation periods: 10, 20 or 30 scans Repetition periods: 3, 5, 10 or 15 minutes

Interfacing

SeaTalk Input	Depth, Speed Over Ground & Course Over Ground, Position, Waypoint number, range, bearing and time to go, Speed through water, Time, Cross Track Error, Heading, Wind, Date, Log/Trip, Pilot Status, Temperature, Man Overboard, and cursor position
NMEA Input	NMEA 0183 (GLL, GGA, GLC, GTD, VTG, BWC, BWR, RMA, RMB, RMC, XTE, VHW, HDG, HDM, HDT, DBT, DPT, APB,VLW, MWV, MTW,WPL, RTE and ZDA)
SeaTalk Output	Cursor data, Guard zone alarm and Navigational data bridged from NMEA
NMEA Output (User selectable)	APB, BWC, BWR,DBT, DPT,GGA, GLL, MTW, RMA, RMB, RMC, RSD, TTM, VLW, VHW, VTG, WPL, ZDA

Appendix B: SeaTalk and NMEA Data Received and Transmitted

The following table defines the data received on the NMEA/SeaTalk ports. Data sources are listed in order of priority except where indicated.

Data Received	Source
Position (LAT/LON)	SeaTalk, GGA, RMC, RMA, GLL
Position (Loran C TD's)	GLC, RMA, GTD
Speed and Course Over Ground	SeaTalk, RMC, RMA, VTG
Waypoint Data	SeaTalk, RMB, APB, BWC, BWR, RMB, XTE
Depth	SeaTalk, DBT, DPT
Apparent Wind Angle and Speed	SeaTalk, MWV (relative)
Boat Speed Through Water	SeaTalk, VHW
Total Log and Trip Log	SeaTalk, VLW
Water Temperature	SeaTalk, MTW
Average Boat Speed through the Water	SeaTalk only
Heading	SeaTalk, HDG, HDM, HDT, VHW
Locked Heading	SeaTalk only (Autopilot / Steering Compass)
Magnetic Variation	SeaTalk, RMC, RMA, HDG
Rudder Angle (not displayed)	SeaTalk only
Time (No priority)	SeaTalk, ZDA, GGA, RMC, GLL, BWC, BWR
Date	SeaTalk, ZDA, RMC
MOB data	SeaTalk only
Autopilot Status (Standby / Auto / Vane / Track)	SeaTalk only
Cursor Range and Bearing (from Chartplotter) Cursor Range and Bearing (from Radar)	SeaTalk only SeaTalk, RSD
Global Alarms - Watch alarm, Wind alarm, Autopilot alarms, Depth alarms. Waypoint arrival	SeaTalk Only SeaTalk, RMB, APB
Waypoint/Route Transfer	SeaTalk, WPL, RTE

* If Magnetic Heading is not available, the True Heading and Variation (if available) are used to generate the magnetic heading.

The display unit transmits the following data, if available, on SeaTalk:

Data Output	SeaTalk	NMEA Out
Position (LAT/LON)	✔	GGA, GLL, RMC, RMA
Position (Loran C TD's)	✔	RMA
Speed Over Ground and Course Over Ground	✔	RMC, VTG, RMA
Waypoint Data	✔	RMB, APB, BWC, BWR
Depth	✔	
Apparent Wind Angle and Speed	✔	—
Boat Speed Through Water	✔	—
Total Log and Trip Log	✔	
Water Temperature	✔	
Heading	✔	VHW
Magnetic Variation	✔	RMA, RMC
Time	✔	ZDA
Date	✔	ZDA
MOB data	✔	—
Cursor Range & Bearing	✔	RSD[2]
EBL/VRM Data	—	RSD[2]
Heading mode	—	RSD[2]
Radar display range	✔	RSD[2]
Radar Tracked targets	—	TTM
Waypoint/Route Transfer	—	WPL, RTE
Global Alarm Waypoint Arrival Alarm	SeaTalk	— APB, RMB

[4] Bridged from NMEA if selected in the System Set Up menu.

Appendix C: Connecting a Raymarine Heading Sensor

The performance of MARPA on the displays is dependent on the quality of your heading sensor.

Raymarine recommend that, for optimum MARPA operation, you use the Pathfinder Smart Heading System (which includes the Gyro Plus 2 unit) or a G-series course computer, connected via NMEA, as your source of heading data. The G-series course computer uses rate gyro compensation.

This Appendix provides connection details for a Raymarine 150G or 400G course computer. For information on the Pathfinder Smart Heading System refer to the handbook supplied with the compass.

If you have a different heading sensor, or require further assistance, please contact your authorized Raymarine dealer or Raymarine Technical Support.

G-Series Course Computer

Note: *A 150 or 400 course computer coupled to the optional GyroPlus unit will provide heading data of equal quality to the 150G or 400G course computer. The method of connecting to your display is the same.*

If you have a Raymarine 150G or 400G course computer we recommend that you configure your system as follows and illustrated below:

- Connect the course computer NMEA1 output to the NMEA input on each of your displays that will be used for MARPA .
- In the System Set Up Menu set Bridge NMEA Heading OFF (see *Bridge NMEA Heading* on *page 5-9*).

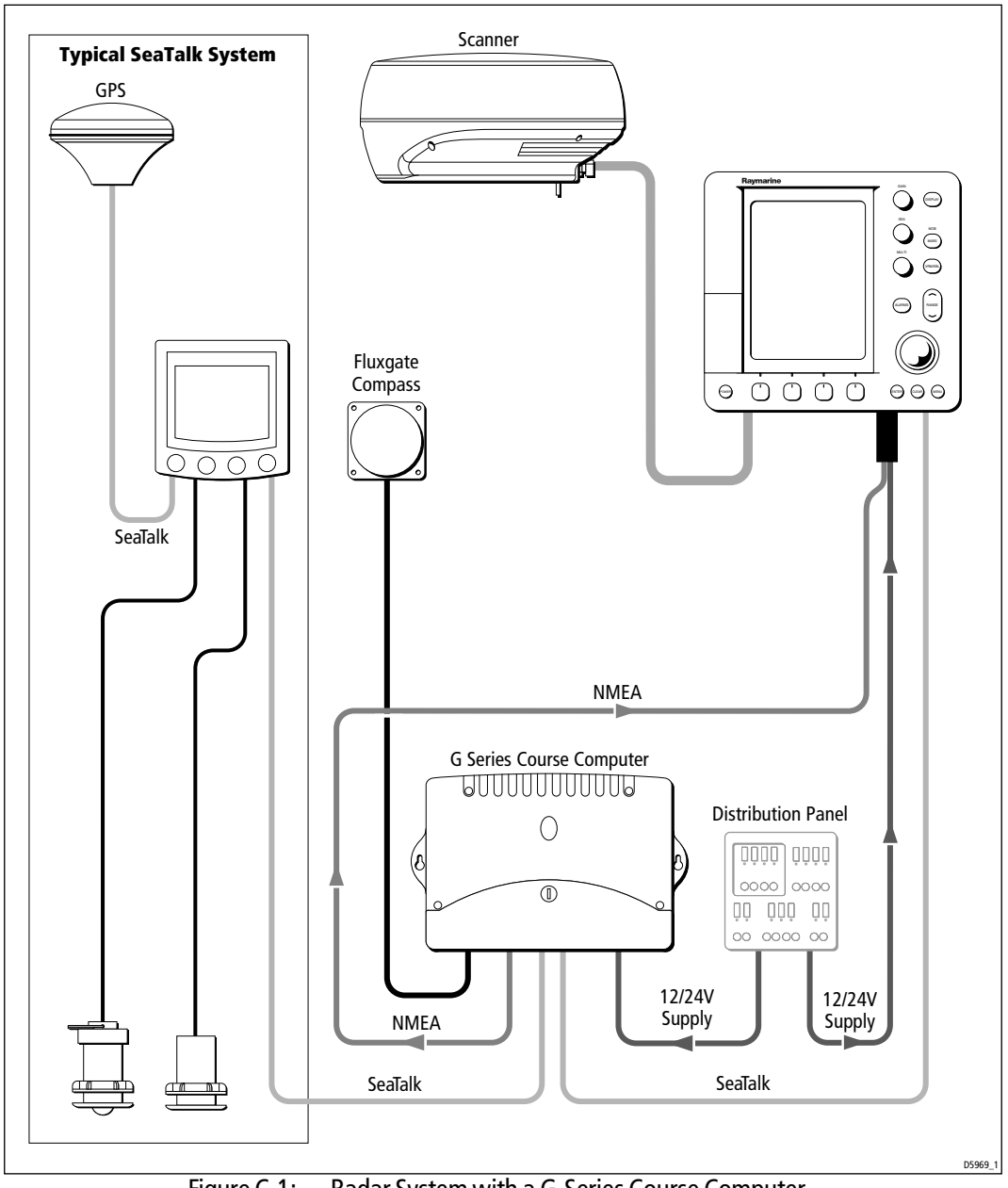


Figure C-1: Radar System with a G-Series Course Computer

Appendix D:Abbreviations

A	Amp
ANSI	American National Standards Institute
AWG	American Wire Gauge
BDI	Bearing and Distance Indicator
Brg	Bearing
CCFL	Cold Cathode Fluorescent Lamp
CD	Course Deviation Indicator
CFR	Code of Federal Regulations
CMG	Course Made Good
COG	Course Over Ground
CRT	Cathode Ray Tube
CTR	Center
dB	deciBels
DC	Direct Current
DMG	Distance Made Good
DR	Dead Reckoning
EBL	Electronic Bearing Line
EMC	Electro Magnetic Compatibility
ETA	Estimated Time of Arrival
FCC	Federal Communication Commission
FLT	Float - floating EBL/VRM
ft	feet
FTC	Fast Time Constant
GPS	Global Positioning System
dGPS	differential Global Positioning System
GRD	Guard Zone
GHz	Giga Hertz
HDG	Heading
Hz	Hertz
MHz	Mega Hertz
IEEE	Institute of Electrical & Electronic Engineers
in, "	inch
Kg	kilogram
kW	kilo Watt
lat	latitude
lbs	pounds

LCD	Liquid Crystal Display
lon	longitude
M	Magnetic
m	meters
MARPA	Mini Automatic Radar Plotting Aid
MBS	Main Bang Suppression
mm	millimeter
MOB	Man OverBoard
MRK	Mark
nm	nautical mile
NMEA	National Marine Electronics Association
POS	Position (of vessel)
RF	Radio Frequency
Rng	Range
rpm	Revolutions Per Minute
SSB	Single Side Band
SHM	Ships Heading Marker
SOG	Speed Over Ground
STC	Sensitivity Time Control
T	True
TFT	Thin Film Transistor
TTG	Time To Go
V	Volts
VHF	Very High Frequency
VMG	Velocity Made Good
VRM	Variable Range Marker
WPT	Waypoint
XTE	Cross Track Error
yds	yards
ZMB	Zoom Box

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